THE IMPORTANCE OF TRANSFER PRICING:

A Microeconomic Theory of Multinational Behaviour Under Trade Barriers

by

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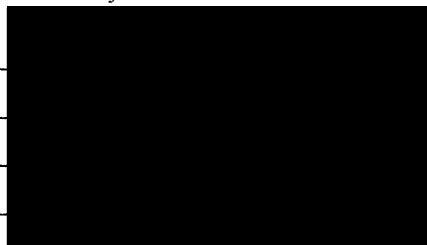
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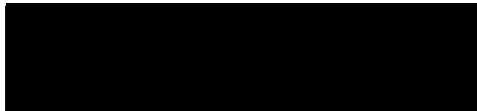Author           Lorraine Alison Boyd Eden

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To My Parents

Garnet and Diana Boyd

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# ABSTRACT

This thesis develops a theoretical model of a multinational enterprise (MNE) consisting of two horizontally integrated firms, both monopolists in their own markets. The MNE is assumed to maximize total profits; hire labor and capital in competitive markets; own a scarce factor on which monopoly rents can be earned through trade; and price discriminate between countries. When cost and revenue differentials exist between firms profit maximization requires intrafirm trade, the direction and volume of trade reflecting these differentials. The value of trade depends upon the transfer price. The thesis discusses the effects of various transfer prices (average cost, marginal cost, fair market value) on factor and product markets; the welfare and efficiency gains from trade; the division of gains among producers, factors, consumers and governments; and the National Incomes and Balance of Payments of the host and home countries. The MNE's behaviour is studied under 1) free trade, 2) a tariff, 3) a profits tax by the home government, 4) taxation of MNE profits by both governments, 5) both taxes and tariffs. Chapter VII broadens the analysis to include vertically integrated multinationals and compares results. The main conclusion is that the theory of intrafirm trade differs from standard trade due to transfer pricing and joint profit maximization. As a result free trade may not maximize world welfare nor bring unambiguous gains to all parties. Tariffs can cause trade expansion and injure the import-competing industry with certain transfer prices. Corporate tax differentials are as much a barrier to free trade for the MNE as tariffs. A pure profits tax on a multinational monopolist is generally nonneutral since international tax neutrality requires equal actual tax rates or a special transfer pricing policy based on marginal export cost under free trade. The most neutral form of tax relief at present is the tax credit although internation equity can be affected even if tax neutrality is achieved. Tax policy is not impotent in a world of taxes and tariffs. Fair market value pricing may cause more distortions than marginal cost pricing. In short, transfer pricing and multinational intrafirm trade have important implications for governments, consumers, factors and producers that are only just being understood. This dissertation is one such attempt.

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# ABBREVIATIONS AND SYMBOLS

MNE is the multinational enterprise

$X_i$ is the domestic output of firm i in country i, i = 1, 2, 3

$Y_i$ is the domestic sales of firm i in country i, i = 1, 2

$P_i$ is the market price charged for $Y_i$

$M_{ij}$ is the volume of i's imports from j , i, j = 1, 2, 3   i ≠ j

$Pm_{ij}$ is the transfer price charged for $M_{ij}$

$C_i$ is total cost of producing $X_i$

$L_i$ is volume of labor employed by firm i, i = 1, 2

$K_i$ is volume of capital employed by firm i, i = 1, 2

$P_{1i}$ is the market price of $L_i$

$P_{ki}$ is the market price of $K_i$

$TT_i$ is the pure profit of firm i, i = 1, 2, 3

$MR_i$ is the marginal revenue from $Y_i$

$MC_i$ is the marginal cost of $X_i$

$AR_i$ is the average revenue from $Y_i$

$AC_i$ is the average cost of $X_i$

$MP_{1i}$ is the marginal productivity of $L_i$

$MP_{ki}$ is the marginal productivity of $K_i$

$MC_{1i}$ is the marginal cost of $L_i$

$MC_{ki}$ is the marginal cost of $K_i$

$MRS_i$ is the marginal rate of substitution between 2 commodities in country
i, i = 1 , 2

$MRT_i$ is the marginal rate of transformation between 2 commodities in
country i

$E_i$ is the price elasticity of demand for good i, i = 1, 2

$a_i$ is the fraction of capital employed by firm i in country i, i = 1, 2

$1-a_i$ is the fraction of capital employed by firm i but resident in
country j, i, j = 1, 2   i ≠ j

b is the fraction of firm 2's profits that is (for tax purposes) repatriated
to firm 1, $0 \leq b \leq 1$

b' is the fraction of firm 3's that is (for tax purposes) repatriated
to firm 1, $0 \leq b' \leq 1$

r is the tariff rate levied on imports by firm 2

$t_i$ is the tax rate on pure profits levied by country i, i = 1, 2

c is the form of tax relief granted by the home government for taxes
paid to foreign governments on the income or property of
foreign affiliates or branches of domestic enterprises

$NMR_i$ is the net marginal revenue of firm i, i = 1, 2 or $MR_i - MC_i$

MPE is a multinational producing enterprise, used as a synonym for MNE

$\Delta$ represents a change in a variable, the distance between two points

# ACKNOWLEDGEMENTS

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Chapter I

INTRODUCTION

> Economic theory has never comfortably digested the large
> diversified firm.  The theoretical system which provides
> the economic justification of a competitive economy
> takes grossly inadequate account of these great adminis-
> trative organizations, and the theory of international
> trade and investment virtually ignores them, in spite
> of the fact that a very important part of both is
> carried on within the compass of their administrative
> framework.  Because of the large international firm,
> the flow of international trade and investment, the
> structure of international prices, and the international
> distribution of income are subject to forces that are
> at times very different from those presumed in ruling
> economic theory.[1]

The study of multinational enterprises and of direct foreign

investment is a new field.  A student finds himself reading in a variety

of disciplines that now discuss international corporations--international

trade, industrial organization, law, public finance, business adminis-

tration, sociology, political studies.  The emphasis in the literature

to date[2] has been on the process of direct foreign investment; why firms

invest abroad; the size and direction of foreign investment; the factors

that characterize direct investment.  Accompanying this has been a stress

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1.  E. T. Penrose, The Large International Firm in Developing Countries,
    1968, page 25.
2.  The literature on multinationals and foreign investment is large and
    growing rapidly.  Some of the more complete works are:
    (1) J. H. Dunning, editor, The Multinational Enterprise, 1971.
    (2) J. H. Dunning, editor, International Investment, Selected Readings,
        1972.
    (3) C. Kindleberger, editor, The International Corporation, 1970.
    (4) P. M. Musgrave, Direct Investment Abroad and the Multinationals:
        Effects on the United States' Economy, 1974.
    (5) G. Paquet, editor, The Multinational Firm and the Nation State,
        1972.
    (6) J. H. Robock and K. Simmonds, International Business and Multi-
        national Enterprises, 1973.
        Also note the bibliographies cited in these books.

on the effects of foreign investment on the home country (where the investor resides) and the host country (where the investment is made), including effects on factors and consumers, on national income and growth, on competition, on trade and the Balance of Payments. Foreign investment is seen as bringing social and economic benefits and costs to both countries. It is beneficial if it causes incomes to increase, higher growth rates, more exports, greater competition. The literature also discusses the conditions under which both countries benefit from foreign investment and the tensions and problems caused by the division of the benefits between nations.

Therefore work on the theory of the multinational corporation can be characterized as follows:

1) The approach to foreign investment has been a macroeconomic approach, studying the impact of multinationals on aggregate income, growth and trade.

2) The work has emphasized the reasons for foreign investment, the process and the effects of this investment.

This dissertation attempts to expand knowledge about the multi-national enterprise by using a microeconomic approach that assumes the foreign investment has taken place and restricts itself to the effects of multinational trade. The thesis develops a theoretical model of a rational multinational enterprise that is a profit-maximizer. It predicts the behavior of the enterprise in response to free trade, to tariffs and to corporate income taxes. The emphasis is on the trade flows between the firms owned by the multinational; on why these related firms trade;

and how trade flows change in response to trade barriers and government

regulation. The effects of the foreign investment process are ignored;

only the effects of intrafirm trade are examined.

The total impact of multinational corporations obviously includes

both types of effects--those caused by the direct investment as it is made,

and those caused by trade between related firms. This thesis therefore

does not contradict the previous literature on foreign investment. It

shifts the emphasis to a microeconomic approach and concentrates solely

on the social and economic effects of trade within a multinational enter-

prise. Hopefully, it complements and expands our knowledge of the

behavior of multinational corporations.

A few journal articles have been written outlining possible

models of intrafirm trade, the problems raised by this trade for govern-

ments, and possible effects of this trade.[3] However, most economic

literature has assumed that the factors determining trade between unrelated

firms also apply to trade between related firms. The writers on intrafirm

trade do claim that multinational trade does differ radically from trade

between unrelated firms because of at least one factor--transfer pricing.

Transfer prices are the prices charged in interaffiliate transactions;

they are prices determined internally within the corporation. Transfer

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3. L. W. Copithorne, "International Corporate Transfer Pricing and
   Government Policy," Canadian Journal of Economics, 1971.
   T. Horst, "The Theory of the Multinational Firm--Optimal Behaviour
   Under Different Tax and Tariff Rates," Journal of Political Economy,
   1972.
   S. Lall, "Transfer Pricing by Multinational Manufacturing Firms,"
   Oxford Bulletin of Economics and Statistics, Aug., 1973.
   T. Parry, "The International Firm and National Economic Policy,"
   Economic Journal, Dec., 1973.
   D. P. Rutenberg, "Maneuvering Liquid Assets in a Multinational
   Company," Management Science Applications, June, 1970.
   C. S. Shoup, "Establishing Transfer Prices in Allocation of Taxable
   Income Among Countries," U.N. Secretariat, Dec., 1973.

prices are needed internally within the corporation for control purposes, cost analysis, motivation of managers, etc. but they can also be used for external purposes, eg. tariff declarations, avoiding foreign exchange restrictions, and minimizing taxes.

The large national firm engaged in trade with an unrelated firm attempts to set a price that will maximize its profits at the expense of the trading partner. The price will tend to reflect the cost conditions involved and the relative bargaining strengths of the two parties, that is, the market price will be determined by demand and supply considerations. Traditional comparative cost doctrines imply that trade will therefore generally increase global resource efficiency and raise world welfare.[4] The presumption is that both firms (and therefore both countries) benefit from this trade.

However, when affiliates engage in trade the trading prices do not reflect the goal of individual firm profit maximization but the goal of joint profit maximization. This principle governing intrafirm trade is fundamentally different from that governing trade between independent national firms. Because of this, traditional views on global efficiency and welfare gains may be in complete error. Do multinationals increase global efficiency through intrafirm trade compared with no trade? How do trade barriers affect intrafirm trade efficiency and the gains from trade? Does intrafirm trade increase world welfare? Do all countries gain from this trade? These are important questions and the answers complex and uncertain.

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4. Although this is a second best argument since perfect competition is not assumed. If the large national firm is located in a small country that cannot affect the world terms of trade, the domestic inefficiency will be eliminated and welfare increased.

In an environment of no governmental intervention the trade gains and their distribution are determined solely by the multinational enterprise. Its choice of production location, R&D location, trade patterns, pricing policies, and financial flows determine the gains and their allocation. There is no presumption that every country must gain from this trade. These allocative decisions affect the distribution of national income between trading countries, their Balance of Payments, factor incomes and movements, consumer prices and producer profits. However, a profit-maximizing multinational will improve resource efficiency by shifting output so as to minimize costs. The effects on national and global welfare are less certain.

Governments have sought to control the multinational enterprise (MNE) and their share of the gains from trade through tax and trade policies, antitrust laws, tax treaties, scrutinizing transfer prices, and Foreign Investment Review Boards. In the U.S. alone tax policies concerning MNE trade include tax treaties eliminating double taxation, tax credits, tax deferral, special tax subsidies such as DISC, WHTC and LDC measures, eliminating tax havens through SubPart F, and clarifying the tax laws, eg. Section 482. These policies affect the environment in which the MNE's operate and alter allocative decisions. The MNE is affected by these policies differently from national firms. The national firm engaged in trade must submit to the legislation. The MNE through transfer pricing may avoid the effects of the policy and even exploit the differences in national tax and trade laws to its own advantage. Taxes and tariffs therefore cause the multinational to alter its output and sales decisions so as to minimize these externally imposed costs. To quote Penrose:

> Thus, the chief dangers of an international firm as a vehicle
> of international investment arise from the fact that it is
> forced to discriminate among countries, because of its legal
> status and because of the commercial and financial policies
> it is almost bound to pursue to minimize its tax payments.
> In consequence the head offices of international firms are
> inhibited in adopting a genuine international neutrality
> in their operations.[5]

The importance of intrafirm trade and transfer pricing to

Canada and to Canadians should also be stressed. Canada has the largest

percentage of foreign-owned industries of all developed countries. Approxi-

mately three-quarters of branches and subsidiaries located in Canada are

American-owned; another 7-10 percent are British-owned. Trade between

Canadian subsidiaries and these parent and sister affiliates represent

a large share of Canada's total trade. Table I.1 demonstrates the importance

of intrafirm trade in Canada's total trade pattern. Between 1964 and

1970 reported intrafirm exports as a percent of total exports increased

from 17 percent to 27 percent. Intrafirm imports as a percent of total

imports over the period rose from 22 percent to 30 percent. That is, at

least 30 percent of Canada's Balance of Trade (branches are not included)

consists of intrafirm transactions between Canadian subsidiaries and

foreign parents and affiliates. The prices charged in these transactions

were not determined by market forces, but were set internally within

the multinational firms in response to internal and external constraints.

Attempts by Canadian or foreign governments to manipulate transfer prices,

adjust tariffs or corporate tax rates will affect the size, direction

and value of this trade.

One can also note the growing importance of intrafirm trade to

total subsidiary trade. In 1970, 70 percent of Canadian subsidiary

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5. E. T. Penrose, p. 273.

Table I.1

THE IMPORTANCE OF INTRAFIRM TRADE BY FOREIGN-OWNED

SUBSIDIARIES TO CANADA'S BALANCE OF TRADE 1964-1970

Value of Trade ($ million)

| Exports and Imports | 1964 | 1967 | 1970 |
|---|---|---|---|
| I.  EXPORTS | | | |
| 1.  total merchandise exports | $8,238 | $11,338 | $16,750 |
| 2.  exports of foreign-owned MNE's | 2,850 | 4,599 | 6,479 |
| 3.  exports of foreign-owned MNE's to parents and affiliates | 1,400 | 3,074 | 4,549 |
| 4.  3) as a % of 1) | 17% | 27% | 27% |
| 5.  3) as a % of 2) | 49% | 67% | 70% |
| II.  IMPORTS | | | |
| 1.  total merchandise imports | 7,537 | 10,772 | 13,833 |
| 2.  imports of foreign-owned MNE's | 2,430 | 4,063 | 5,536 |
| 3.  imports of foreign-owned MNE's from parents and affiliates | 1,628 | 2,854 | 4,094 |
| 4.  3) as a % of 1) | 22% | 26% | 30% |
| 5.  3) as a % of 2) | 67% | 70% | 74% |

Sources:

lines I.1 and II.1--M. Archer, Introductory Macroeconomics:  A Canadian Analysis, 1973, page 363.

lines II.2 and 3 and II.2 and 3 for 1964 and 1967

Foreign Owned Subsidiaries in Canada 1964-1967, Cat. # 1.67-870, Queens Printer, 1970, pages 23-24.

lines I.2 and 3 and II.2 and 3 for 1970--Statistical Supplement to Foreign Owned Subsidiaries in Canada 1964-69, Queens Printer, 1972, Appendix VIII.

exports  and 74 percent of imports were sold to and purchased from
affiliates. Purchases from and sales to unrelated firms declined steadily
throughout the period.

Another way to view the importance of transfer pricing to the
Canadian economy is by examining the payments made by Canadian subsidiaries
to parents and affiliates. According to Rutenburg [6] multinationals shift
liquid assets between affiliates by manipulating transfer prices and service
payments, by altering dividend payments, and by making short term inter-
affiliate loans. Each of these methods is an imperfect substitute for the
other and the multinational's choice of payment method will depend on the
tax, administrative, and interest costs involved. As shown in Table I.2
imports of goods and capital  equipment account for 83 percent of payments
to the United States and 90 percent to other foreign countries by Canadian
subsidiaries of foreign firms. These transfer paymmets represented over 4
billion dollars in 1970. Dividends have lost relative importance as a payment
method over this period. By underinvoicing imports, funds can be shifted
into the importing country and overinvoicing can be used to shift profits
outside the country.

The dissertation is divided into eight chapters. The first six
chapters are based on a model of two related firms producing the same
product in their local market s under monopolistic conditions and engaging
in intrafirm trade. The conditions under which these horizontally integrated
manufacturing firms will engage in trade are developed in Chaper II under the
assumption of free trade. Also the welfare and efficiency gains from trade
under no trade barriers are discussed. Chapter III introduces a tariff
on imported commodity flows and the effects on the multinational's

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6. D.P.Rutenburg, op. cit.

Table I.2

PAYMENTS TO PARENTS AND AFFILIATES ABROAD

BY FOREIGN-OWNED SUBSIDIARIES IN CANADA--1967-1970

(% distribution and total $ value millions)

| Payment | To the United States (% distribution) | | To Other Foreign Countries (% distribution) | | To all Foreign Countries ($ value millions) | |
|---|---|---|---|---|---|---|
| | 1967 | 1970 | 1967 | 1970 | 1967 | 1970 |
| Merchandise Imports | 77.8% | 81.3% | 85.0% | 86.6% | $2,736 | $3,982.8 |
| Capital Equipment | 3.4 | 2.2 | 3.3 | 2.7 | 118 | 111.6 |
| Dividends | 9.4 | 8.0 | 6.9 | 4.3 | 309 | 358.3 |
| Other Current[1] Payments | 9.4 | 8.5 | 4.7 | 6.5 | 296 | 393.6 |
| Total Payments | 100.0 | 100.0 | 100.0 | 100.0 | 3,459 | 4,846.3 |
| $value of total payments millions | $2,825.0 | $4,019.2 | $634.0 | $827.1 | $3,459 | $4,846.3 |

1.  Other current payments include interest, royalties, rents, research and development charges and managerial and administrative fees.

Sources:

Foreign-Owned Subsidiaries in Canada 1964-1967, Cat. # C.67-870, Queens Printer, 1970, page 34.

Statistical Supplement to Foreign-Owned Subsidiaries in Canada 1964-1969, Queens Printer, 1972, Appendix V.

output, sales and pricing decisions and the importance of transfer pricing to the results are emphasized. The gains from trade are reexamined under the tariff, including effects on national income, location of production, trade flows, factor shares and factor movements, and the Balance of Payments. In Chapter IV a tax on pure profits is levied by the home government. This introduces the problems of tax equity and efficiency and of repatriation rates. The gains from trade are reexamined under the tax. In Chapter V both countries are assumed to levy profit taxes. Current practices such as deferral, tax credit versus deduction, LDC regulations and Section 482 rules are examined for their effects on tax equity and efficiency, and on transfer pricing and trade flows. Chapter VI assumes both taxes and tariffs apply and explains how the behavior of the multinational changes in response to these constraints. Chapter VII develops a rudimentary model of three related firms where one firm supplies raw materials to two secondary firms. This model of vertical integration yields results similar to the horizontal model. And finally Chapter VIII summarizes the implications and predictions of the model.

This dissertation, I think, raises as many questions as it answers. I hope other writers will find the formulation of the model interesting and worthy of further pursuit.

Chapter II

FREE TRADE AND THE MULTINATIONAL ENTERPRISE

The Basic Model

Introduction

The traditional theory of international trade is devoted to explaining why nations trade; what commodities will be traded; what are the gains from trade; how the gains are divided among countries; and how adjustments occur when barriers to trade exist.[1] Perfect competition is assumed in factor and commodity markets. Factors are assumed to be mobile within national boundaries but immobile between countries. The theory of comparative advantage is used to explain the patterns and gains from trade. A country gains from producing those commodities in which it has a comparative advantage and exporting them in return for commodities it can produce less efficiently. Through trade a country can escape the boundaries of its own production possibilities and consume a larger quantity of goods. Free trade permits efficient allocation of resources and therefore maximizes global output.

Although the international trade literature has widened to include monopolies in commodity markets[2], the theory of the multinational enterprise is still to be found in the international business literature. The assumption appears to be that multinational trade is governed by the same principles as trade between unrelated firms. Intrafirm trade is assumed to be affected by the same factors and the gains from trade to accrue in the same manner as in the pure theory. The tendency of international trade theory to ignore intrafirm trade may be due to the approach made by

1. For example, see C. Kindleberger, International Economics, 5th edition, 1973; H. Robert Heller, International Trade Theory and Empirical Evidence, 1968; David Young, International Economics, 1970.
2. R. N. Batra, Studies in the Pure Theory of International Trade, 1973, Chapter 11.

economists to trade problems. The standard question asked is "why do nations trade?" Nations do not trade; firms do. The decisions about the patterns of trade are made by business enterprises. Although governments influence these decisions, the concentration by trade theorists on countries rather than firms as the motivators of trade led them to ignore the role of the firm. Firms were assumed to be perfect competitors producing and trading standard undifferentiated commodities such as wheat and cotton.

In fact trade is typically carried on by large firms operating in imperfect markets. The general presumption in favor of free trade and free factor movements may not apply in a world of oligopolistic decision makers. As Batra has shown[3] where commodity markets are monopolized (in a 2-good world) free trade may be inferior to no trade if a country exports the commodity with the higher elasticity of demand in the no trade situation.

Where international trade occurs between related firms the volume of trade will be determined by comparative advantage . The value of intrafirm trade, however, may be determined by other factors since the price charged in these transactions is an internal accounting device and not a meaningful measure of value . The transfer price, the price charged in shipments of commodities between related firms, may bear no relation to an arm's length price. Therefore the multinational enterprise can affect the values of exports and imports of the countries in which its firms are located and their Balance of Payments. Thus the results predicted by the traditional inter-national trade literature may bear little relation to the pattern of trade where multinational firms are involved. To quote Edith Penrose, "The eco-nomics of the large international firm...is a subject worthy of economic analysis in its own right."[4]

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3. Batra, p. 300.
4. E.T. Penrose, The Large International Firm in Developing Countries, 1968, page 19.

Assumptions

This chapter explains the behavior of a multinational enterprise
(MNE) with horizontally integrated affiliates under no trade barriers.
The terms "multinational," "international," "transnational" are used
interchangeably to refer to a business enterprise with producing affiliates
in more than one country. Multinational enterprises are autonomous inter-
national organizations. The MNE is autonomous because it is not effectively
responsible to any outside body; it is international in that it operates
across national borders although the parent firm has a nationality; it is
an organization in that the parent firm controls the administrative frame-
work and develops overall company policies, especially in financial matters.
In general the management of an MNE determines the policies of the organiza-
tion and not the shareholders. The enterprise has considerable economic
power because of its monopolistic market position, the volume of resources
it controls, the money it spends, the size of markets in which it operates.
Therefore, says Penrose, it has "the ability to significantly influence
the use of resources, the distribution of goods, the prices of products,
the tastes of consumers, the development of new technology, and the
distribution of income."[5] This chapter investigates the influence of the
MNE on these variables when there are no barriers to trade.

The chapter develops a model of a multinational enterprise that
is a long run partial equilibrium analysis of a large international
organization with producing firms located in several countries. The model
specifically assumes two firms, one located in the home country, the

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5. E. Penrose, The Growth of Firms, Middle East Oil and Other Essays,
    1971, page 93.

parent firm, and the second located in the host country, the subsidiary

or branch firm.  Both firms produce the same secondary product for sale

in their own domestic markets.

The assumption of horizontal integration where the foreign

affiliate produces the same good as the domestic firm, rather than vertical

integration where one firm produces an input for the other firm's production

process, is employed by this model.  This is because, according to Caves,[6]

foreign investment by manufacturing firms occurs mainly in oligopolistic

industries producing differentiated products.  The parent firm acquires

multiple plants located in different countries because it realizes that

market interdependence extends beyond national boundaries.  In industries

with oligopolistic structures producing differentiated products such as

automobiles, chemicals, electrical appliances, most foreign investment

has been in horizontal form to exploit or protect an economic advantage

against potential entrants.  According to John Dunning[7] horizontal opera-

tions of MNE's currently attract the greatest interest of both host and

home countries because of the economic implications for production loca-

tion, trade flows, and transfer price manipulation.  He notes that most

horizontal integration occurs in high technology areas with oligopolistic

market structures.

6.   R. E. Caves, "International Corporations:  The Industrial Economics
     of Foreign Investment," Economica, Vol. 38, No. 149, Feb., 1971.
7.   J. Dunning, "The Multinational Enterprise:  The Background,"
     in J. Dunning, editor, The Multinational Enterprise, 1971.

More attention in the business literature has been paid to vertical integration in order to develop an optimal transfer pricing rule that would motivate managers and provide a measure for evaluating the profitability of divisions.[8] One economist has developed an economic model of a vertically integrated multinational corporation engaged in trade across nation frontiers.[9] In order to point out the similarities and differences between vertically and horizontally integrated intrafirm trade Chapter VII develops a rudimentary model of the behaviour of three related firms under trade barriers where one firm acts as supplier of raw materials to the other two secondary firms.

In the model of the multinational enterprise developed in this thesis the MNE is assumed to have a monopoly on a scarce factor. This factor may be technology, a natural resource, superior management, differentiated products due to advertising or distribution skills. This special asset has the characteristic of a public good--once it is developed the marginal cost of applying this factor elsewhere is zero or near zero. Optimality requires that this special knowledge should be made freely available to all potential users without charge. The private sector, however, will not undertake to create this knowledge unless it receives a return greater than marginal cost. In practice business enterprises are encouraged to do research by patents granting temporary monopolies on the knowledge they produce. Patents, in effect, grant firms a legal right to charge a monopoly price.

8. Some articles on internal transfer pricing and motivation are: J. Hirshleifer, "On the Economics of Transfer Pricing," Journal of Business, July, 1956; J. Ronen and G. McKinney, "Transfer Pricing for Divisional Autonomy," Journal of Accounting Research, Spring 1970; and R. Abdel-khalik and E. Lusk, "Transfer Pricing--A Synthesis" in The Accounting Review, Jan., 1974.
9. L. W. Copithorne, "International Corporate Transfer Prices and Government Policy," Canadian Journal of Economics, Aug., 1971.

The multinational enterprise possessing this superior knowhow has an advantage over a local firm. Many writers have suggested that the crux of foreign investment is the transfer of knowledge.[10] Through foreign investment the MNE can earn monopoly rents on the scarce factor. Direct investment occurs if the marginal cost of applying the technology in an additional market is low and if actual production abroad results in higher rents than exporting or licensing of foreign producers.

This model therefore assumes the goal of the multinational enterprise is to maximize the economic rent on the scarce factor owned by the MNE. The transmission of knowhow is assumed costless. Therefore assuming the demand elasticities are determinate and differ between national markets the corporation has an incentive to price discriminate between them so as to maximize total profits. The MNE could follow one of three possible pricing policies; 1) standard worldwide base price, 2) domestic price and a standard export price, or 3) market differentiated prices. Profits are largest where the MNE takes account of market conditions.[11] If the corporation cannot discriminate and follows a standard worldwide price this additional constraint results in smaller profits but less administrative costs. This is discussed in Appendix II.5.

The MNE is assumed to set up the foreign plant without any transfer of the general factors, labor and capital. Only technology, whose transmission is costless, is exported. The corporation employs both labor and capital purchased in perfectly competitive markets.

10. Proponents of what is called the oligopoly theory of foreign investment include S. H. Hymer, "The International Operations of National Firms: A Study of Direct Investment," unpublished doctoral dissertation, MIT, 1960; H. G. Johnson, "The Efficiency and Welfare Implications of the International Corporation," in J. Dunning, editor, International Investment, 1972; R. E. Caves, op cit.
11. D. P. Rutenberg, "Three Pricing Policies for a Multiproduct Multinational Company," Management Science: Applications, Vol. 17, No. 8, April, 1971.

Factor market  assumptions of perfect   mobility of capital and immobility

of labor across national borders are used rather than general mobility assump-

tions with certain different results.First,since the corporation is assumed

to borrow all of its capital any corporation income tax falls solely on

the rent to the scarce factor, the pure profit.  The returns to capital

are not directly affected.  Second, the supply of factors to the MNE is

assumed infinite so the incidence of trade barriers cannot be passed

backward onto the owners of the general factors.  Third, the assumption of

perfect factor market competition assures full employment of labor and

capital in each country.  Fourth, since capital is mobile across national

borders the real return to capital will everywhere be the same.  These

specific assumptions are made in order to more easily handle the compli-

cated problems of the gains from intrafirm trade, the division of the

gains, and the effects on the Balance of Payments between the trading

countries.

Although the supply curves of labor and capital facing the

MNE are infinitely elastic the marginal cost of production curves facing

the parent and foreign firms are assumed to be upward sloping  owing to

presence of the scarce factor, technology.[12]  Assuming that the technology

is not equally efficient in the two production plants, and that labor costs

differ, this results in differing  marginal cost curves in the foreign

and domestic firms.  The cost differentials provide a basis for intrafirm

trade.  Also the scarce factor is assumed not to enter as a factor into

the production function of each firm but as a multiplicative coefficient

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12.  For a discussion of a rising marginal cost curve when factor prices
     are constant see M. Friedman, Price Theory – a Provisional Text,
     1962, Ch. 5 and 6.

(following Musgrave).[13] This has the effect of widening the profitability differentials between countries and encouraging foreign investment and trade.

In summary, the multinational enterprise is assumed to consist of two related firms producing the same commodity in different countries for sale in their respective domestic markets. The corporation owns a scarce factor, technology, and the goal of the corporation is to maximize the economic rent from this factor. The enterprise purchases the services of labor and capital in perfectly competitive factor markets. Where demand elasticities in the two markets differ the MNE will price discriminate between them if possible. Where cost and revenue conditions differ a basis for intrafirm trade may exist.

## Variables Used in the Analysis

The Following Symbols are Adopted:

$X_i$ is the domestic output of firm i in country i, i = 1,2

$Y_i$ is the domestic sales of firm i in country i

$P_i$ is the market price charged in domestic sales

$M_i$ is the volume of i's imports

$Pm_i$ is the transfer price charged for i's imports

$C_i$ is the total cost of producing $X_i$

$L_i$ is the volume of labor employed by firm i

$K_i$ is the volume of capital employed by firm i

$Pl_i$ is the market price of labor employed by firm i

$Pk_i$ is the market price of capital employed by firm i

$TT_i$ is the pure profit of firm i, the return of the scarce factor technology

13. P. B. Musgrave, Direct Investment Abroad and the Multinationals: Effects on the United States' Economy, 1974, page 77.

The Following Relationships are Assumed:

$Y_i = f(P_i)$ where $dP_i/dY_i < 0$     $i = 1,2$

$C_i = f(X_i)$ where $dC_i/dX_i > 0$

$X_i = f(L_i, K_i)$ where $dX_i/dL_i > 0$ and $dX_i/dK_i > 0$

$L_i = f(Pl_i)$ where the demand for labor is inversely related to the market

   price and the supply of labor is infinitely elastic to the firm

$K_i = f(Pk_i)$ and the same factor demand and supply conditions hold as for

   labor

The Following Relationships are Used:

$M_i = Y_i - X_i = X_j - Y_j$ where $i = 1,2$ when $j = 2,1$

$M_1 + M_2 = 0$   The imports of one firm must equal the exports of the other.

$C_i = Pl_i L_i + Pk_i K_i$   Total production costs are the sum of the costs of the

   variable factors.  The scarce factor, technology, influences the slope

   of the function but is not included in it.

$TT_i = P_i Y_i - C_i - Pm_i M_i + Pm_j M_j$   Pure profits of firm i are domestic sales

   plus exports minus domestic production costs minus imports.

## Profit Maximization

   The section on "Assumptions" above notes that the multinational
enterprise would rationally pursue maximization of total corporate profits,
taking account of the cost and revenue conditions in all locations simul-
taneously.  It is useful, however, to indicate the importance and impli-
cations of this pursuit of 'joint' profits by assuming, initially, that
each component firm is required to act independently.  That is, each
production facility seeks maximum profits in its own market without
cooperation, trade, or any sort of interrelations with its sister affiliates.
The obvious extreme independence of the firms acting as isolated monopolists

in this initial situation illuminates the raison d'etre of the large

international enterprise and the crucial role played by intrafirm trade,

and therefore by the transfer price.

Assume initially that MNE does not engage in intrafirm trade,

but operates separately in each market. In this case the conditions for

individual firm profit maximization apply--each firm should produce and

sell where marginal revenue equals marginal cost of the firm. (See

Appendix II.1) This is illustrated in Figure II.1.

Figure II.1 shows the cost and revenue curves of firms 1 (the

parent firm) and 2 (the host firm). Linear curves are assumed for ease

of analysis. If there is no intrafirm trade firm 1 produces $OY_1^O = OX_1^O$ at

$P_1^O$ where the marginal cost and marginal revenue curves intersect. Firm

2 produces and sells $OY_2^O = OX_2^O$ at $P_2^O$ where $MR_2$ and $MC_2$ intersect. If the

marginal revenue and marginal cost curves of the two firms intersect at

exactly the same level it is also true that $MR_1 = MC_1 = MR_2 = MC_2$ which,

as shown in Appendix II.1, is the condition for strict joint profit maxi-

mization when the firms engage in trade. That is, the marginal condi-

tions for joint profit maximization are satisfied even though no intrafirm

trade exists.

If, however, the cost and revenue curves intersect at different

levels, it must always be true that total profits are increased by bringing

the cost and revenue conditions into equality, that is, by equating $MR_1 =$

$MC_1 = MR_2 = MC_2$. (See Appendix II.3) Let us define the 'low cost--low

revenue firm' as the firm whose marginal revenues and marginal costs are

the lower in the no trade equilibrium; that is, the firm whose marginal

revenue and marginal cost curves intersect below the intersection point

of the MR and MC curves of the other firm. In Figure II.1 firm 1 is the

Figure II.1

Profit Maximization by a Two-Plant Two-Market Discriminating Monopolist

(a)                    (b)                    (c)
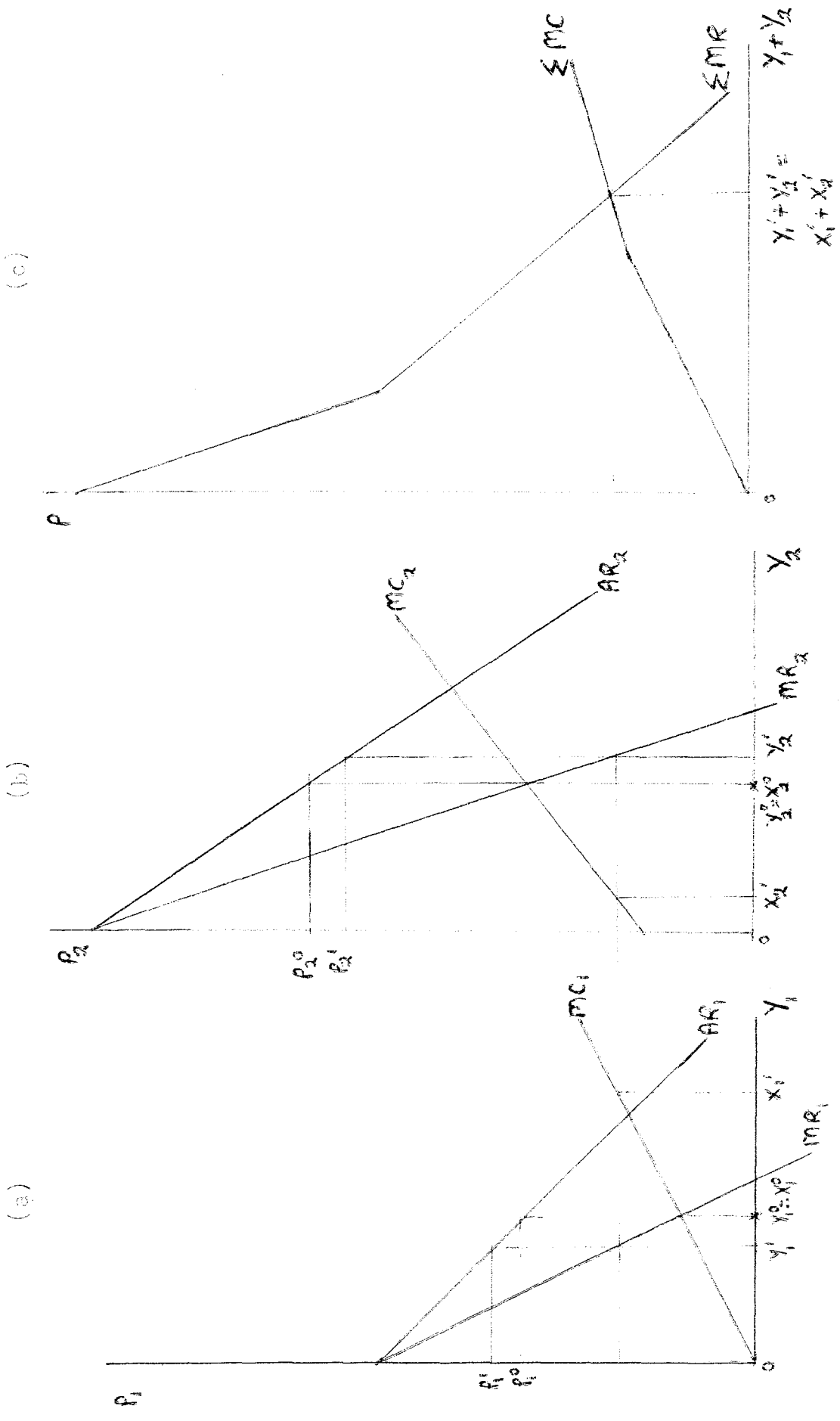
'low cost--low revenue' firm and firm 2 can be regarded as the 'high cost--high revenue' firm. By allocating more production to the low cost firm from firm 2 marginal cost rises for firm 1 and falls for firm 2. By shifting production the MNE behaves as a multiplant profit maximizer setting $MR(Y_1 + Y_2)$ equal to $MC_1 = MC_2$. By reallocating sales from the low revenue firm to the high revenue firm the MNE raises MR of firm 1 and lowers MR of firm 2. In so doing the corporation acts as a two market discriminator setting MC $(X_1 + X_2)$ equal to $MR_1 = MR_2$. Reallocating total sales to equate $MR_1$ with $MR_2$ does not affect total sales. Similarly reallocating total output to equate $MC_1$ with $MC_2$ does not affect total output. But bringing $MR_1 = MR_2$ into equality with $MC_1 = MC_2$ may require changes in total output and total sales. Total output and sales will increase if the equalized marginal revenues exceed the equalized marginal costs. Total output and sales will decline where MC exceeds MR. In either case profits must be increased by bringing MR and MC into equality. The conditions under which output and sales rise or fall in the linear case are proven in Appendix II.3.

To determine the new levels of output and sales after intrafirm trade is introduced Figure II.1 may again be used as an illustration. To determine total sales and their allocation after trade when $MR_1 = MR_2$ the $MR_1$ and $MR_2$ curves are horizontally summed and shown in (c) as the $\Sigma MR$ curve. This curve shows what total sales are at each level of marginal revenue where $MR_1$ equals $MR_2$. To determine the allocation of these sales we read back horizontally across to the $MR_1$ and $MR_2$ curves and down to determine $Y_1$ and $Y_2$. To determine total output and its allocation when $MC_1$ equals $MC_2$ the cost curves are horizontally summed and shown in (c) as the $\Sigma MC$ curve. This curve shows total output when $MC_1 = MC_2$ at each level of marginal cost. To determine the allocation of output we read horizontally back to the cost curves and down to determine $X_1$ and $X_2$. The intersection of the $\Sigma MR$ and $\Sigma MC$ curves fulfills two conditions:

1.  All output is sold. $X_1 + X_2 = Y_1 + Y_2$.

2.  The condition for joint profit maximization under trade is met.

$MR_1 = MC_1 = MR_2 = MC_2$.

The allocation of output and sales under trade is determined by reading horizontally across from the intersection of $\Sigma MR$ with $\Sigma MC$. Where this level cuts $MR_1$ and $MR_2$ determines the division of sales, $OY_1^1$ and $OY_2^1$. Where this level cuts the $MC_1$ and $MC_2$ curves determines the division of output, $OX_1^1$ and $OX_2^1$. In firm 1, the low cost--low revenue firm, trade causes output to expand and domestic sales to contract. The difference $X_1^1 - Y_1^1$ is exported to firm 2. Domestic price rises for the home consumers to $P_1^1$ from $P_1^o$ as domestic sales contract. In firm 2, the high cost-- high revenue firm, output contracts and sales expand when trade is intro- duced. The difference, $Y_2^1 - X_2^1$, is imported from firm 1. Consumer price falls to $P_2^1$ from $P_2^o$ as sales expand. Total output and sales may be higher, lower or unchanged depending on the conditions specified in Appendix II.3 relating to the slopes and intercepts of the MR and MC curves.

Where differentials in marginal costs and revenues exist the multinational corporation will engage in intrafirm trade. By so doing, it maximizes the economic rent it receives on the technology employed in the production processes. Production will be reallocated to the low cost firm and sales to the high revenue firm where $MR_1 = MR_2 = MC_1 = MC_2$. The traditional theory of free trade holds that unrestricted commodity movement will result in resources being used where they have a comparative advantage. That is, free trade leads to more efficient resource allocation. In this model of a profit-maximizing MNE under free trade resources are reallocated so as to minimize costs for any total volume of output. In this sense (although a second best argument compared to perfect competition)

resources are used more efficiently on a worldwide basis. The standard
free trade argument also contends that world output from a given set of
resources will be increased by specialization and trade. However, intra-
firm trade may result in a smaller or an unchanged volume of total output
and sales rather than increased output. Since we have assumed full employ-
ment of all factors, even if total output of the corporation declines,
world output may remain unchanged as other firms reemploy the factors
released by the MNE. Intrafirm trade raises, lowers, or leaves unchanged
the share of MNE output in world output.

<div style="text-align:center">The Transfer Price</div>

When there are no barriers to trade the process of maximizing
corporate profits is unaffected by the transfer price. The price charged
for exports between the two firms is merely an accounting device, affecting
the distribution of profits but not total profits. Not only the division
of profits is affected, but also the Balance of Payments between countries
1 and 2 since the transfer price determines the value, as distinct from
the volume, of trade. It also therefore affects the division of national
and domestic income between the trading countries. How the corporation
chooses a transfer price is therefore of importance to the division of
gains from foreign investment between the home and host countries.

A transfer price may be either 'fixed' or 'variable.' That is,
the price may fluctuate with sales or output of either the exporting or
importing firm, or it may be set at a constant level for long periods
of time. A fixed or posted transfer price allows easy calculation of the
division of profits once the average production cost and final selling
price are known. If, however, the transfer price varies with output or

sales the per unit distribution of trade profits also depends on changes

in output or sales. For example, a transfer price based on domestic selling

price of the exporter will be affected each time that domestic sales are

affected. Increased sales will lower the domestic price and the transfer

price for any volume of exports. A transfer price based on average pro-

duction cost of the exporter will rise when domestic production increases,

or the cost function shifts upward. Governments, by encouraging 'arm's

length prices' or 'full cost pricing', are encouraging use of variable

transfer prices which, as shown later, have predictable effects on pro-

duction, sales, exports, and prices that are different from the effects

of a fixed transfer price.

The setting of the transfer price may also be affected by environ-

mental factors. If the corporation perceives the role of the exporting

firm to be that of a service center for the importer the transfer price

will be set at or close to average production cost and all or most trade

profits will be declared by the importing firm. If profit center concepts

are followed the price will reflect profit to both firms. If the firms

are given the authority to negotiate their own transfer prices, the price

will depend on the bargaining powers of the officials of the two firms,

and will be affected by such factors as availability of outside supplies,

volume of trade in relation to total sales and purchases, degree of excess

capacity & so on. The transfer price may be set for purely internal reasons

with no reference to outside factors.

If the corporation only partly owns the firm in the host country

the parent corporation may attempt to allocate less of the total profits

to the host country by manipulating transfer prices, or charging for

technology that would be provided free of charge to a wholly owned firm.
Partners in the joint venture may attempt to increase their share of profits
also.

If the goal of national trade unions is to increase domestic product-
ion and employment, when barriers to trade exist, these unions can have an ef-
fect if  they can influence transfer prices. Unions that are involved  in
profit-sharing plans or who have access to profit statements can lobby for
pricing policies that bring maximum benefits to themselves. Often unions
of the parent firm will lobby for transfer prices that encourage local
output and exports rather than foreign direct investment that they see as
a direct job threat.

Similarly governments can affect business transfer prices through
their tax and tariff regulations. The goals of these policies, whether higher
government revenues, greater domestic employment and income, or lower prices,
can be conflicting, and policies may have to be adjusted to take account of
these conflicting results.


## Factor Utilization Conditions

When the firms do not engage in trade, profits are maximized (and
costs minimized) when each firm equates the inverse of its marginal revenue
to the ratio of the marginal productivity of each factor to its marginal factor
cost. (See Appendix II.2.) Since the marginal cost of each factor in perfect
competition is its market price the factor utilization condition is
$1/MR_i = MP_{Li}/P_{Li} = MP_{Ki}/P_{Ki}$. Without trade flows marginal revenues are not necess-
arily equal and thus marginal productivities per factor dollar are not equal
between the firms. It is assumed that labor is mobile within each country but
immobile internationally whereas capital is perfectly mobile. As a result capital
prices are equalized internationally between the two multinational affiliated

countries while labor prices are not. However, since there is no trade

the marginal productivity of capital varies between the two firms, being

higher in the firm with the lower marginal revenue in equilibrium.

When intrafirm trade is introduced $MR_1$ and $MR_2$ are brought into

equality. Therefore the marginal productivity per dollar of each factor

is the same for the two firms. If firm 1 initially had the lower marginal

revenue in equilibrium, trade causes this revenue to rise. If the supply

of factors is perfectly elastic, factor prices are unchanged and therefore

the marginal product of both factors must fall when trade occurs. Falling

marginal factor products imply increased production by firm 1. Since firm

1 initially was the low cost--low revenue firm, equating the marginal revenues

implies expansion of $X_1$ and contraction of $Y_1$. Similarly if firm 2 is the

high cost--high revenue firm, trade causes the marginal products of labor

and capital to rise if factor markets are perfectly competitive. Less

output of $X_2$ is produced while more domestic sales of $Y_2$ are made. Note

that intrafirm trade also causes the marginal productivity of capital to

be equalized between the two firms.

The assumption of perfect factor markets may seem unrealistic

to the reader. Large international firms probably do affect factor prices,

especially where the factors are industry-specific. For our purposes it is

sufficient to assume that the corporation takes factor prices as given.

As Batra notes[14] factor prices can be assumed fixed for the corporation

in either of two situations. Where the price-output decisions are made

at the individual plant level, assuming there are several plants, the

conditions for perfect factor markets will be satisfied. Or if factor

markets are unionized, factor prices can be considered given if the MNE

can purchase any quantity of factors at the prices accepted by the union.

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14. R. N. Batra, p. 286.

If the factors are not purchased in competitive markets, ie. if the firms do have an effect on factor prices, intrafirm trade will alter relative factor prices in the two countries. The firm with the lower marginal revenue now finds that as MR rises factor productivity falls and factor prices rise somewhat depending on the elasticity of factor supply and the elasticity of factor substitution. Increasing output causes more factors to be hired which raises their prices and lowers their productivity. As proven by Batra[15] the factor used intensively by the expanding industry find both its absolute and its relative factor price rising when intrafirm trade is introduced. The firm with the higher marginal revenue before trade finds that factor prices decline and factor productivity rises under trade as output declines. The factor used intensively in the declining industry suffers both an absolute and relative loss in income after trade.

## Summary

In order to induce investment abroad rather than exports or licensing the multinational enterprise must have some superior skill or advantage over a domestic firm that compensates for the disadvantages of locating in a foreign environment. Many economists have suggested that technology is the key to foreign investment. Ownership of a scarce factor protected by patents allows a firm to accumulate monopoly rents on the use of the technology. Since the marginal cost of transferring knowhow between countries is very low the MNE has an incentive to behave as a discriminating monopolist in order to maximize the rent on the scarce factor. Where profits

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15. R. N. Batra, page 295.

are maximized by foreign production rather than licensing or exports

foreign direct investment occurs. This is the standard oligopoly argument

for direct investment.

However, we can proceed further than this. Once the foreign

investment is made, where marginal costs and revenues vary between production

facilities larger profits on the scarce factor can be earned if the related

firms engage in trade. Through trade, costs can be minimized as production

is shifted to the low cost firm and revenues maximized as sales are shifted

to the high revenue market. The MNE reallocates output and sales until

$MR_1 = MC_1 = MR_2 = MC_2$. Under free trade the transfer price does not

affect the profit maximizing decisions. It does, however, determine the

allocation of profits and the value of intrafirm trade as shown by the

Balance of Payments between the two countries.

Intrafirm trade causes a rationalization of resources used by

the MNE. This rationalization may be regarded as an increase in worldwide

efficiency, in the sense that any given total output level is produced at

least cost. If factor prices are unaffected all of the benefit accrues

initially to the corporation which adjusts its prices and thus affects

consumers in both countries. If factor prices are affected factors as

a group may gain from this reallocation of resources although factors in

one country may lose while those in the other country gain from trade.

This leads us into a discussion of the gains from trade and the division

of these gains.

## The Gains From Trade

### Introduction

The gains from trade argument is one of the first theories studied by a student of international trade. Under perfect competition in factor and commodity markets free trade will lead to a potential maximum of social welfare. The standard trade model employs the assumptions of two countries, two factors and two commodities. Our analysis has proceeded in terms of one good only. We can, however, integrate the two models by assuming the second good is the numeraire so that the relative price ratio of the two goods reduces simply to the price of the first commodity. With the introduction of multinational corporations and monopolized goods markets the first best argument for free trade, the terms of trade thesis, may not hold. In addition to the welfare loss caused by the presence of domestic monopolies, intrafirm trade may either raise or lower the welfare levels of the countries involved.

The gains from trade thesis can also be examined in terms of gains to the groups affected by trade. The terms of trade argument for free trade shows that nations as a whole benefit from trade under certain conditions but this does not imply that all groups will gain, or gain equally. Three groups can be distinguished: producers, factors and consumers. Producers gain if profits are increased; factors gain if their incomes are increased; consumers gain if commodity prices decline. We can examine the potential gains of each group as a whole or the division of gains between the members of a group as specified by nationality.

Finally, by examining the effects of intrafirm trade on the national and domestic incomes of the two countries and on the Balance

of Payments between them we can see the impact of intrafirm trade on the

multinational's share of each country's income and on the current and

capital accounts.

In summary, the gains from trade can be viewed from several

angles:  1) the first best argument for free trade of maximizing social

welfare of all countries, 2) second best arguments on the potential dis-

tribution of income among producers, factors and consumers; 3) the gains

to national and domestic income of each country and the Balance of Payments

effects.


## The Welfare Gains From Free Trade

Where commodity factor markets are perfectly competitive so

that MRS = MRT in each country the gains from trade arise from equating

marginal rates of substitution and marginal rates of transformation between

countries.[16]  Through trade a country can move outside the boundaries of

its production possibilities curve and attain a higher community indif-

ference curve (and therefore a higher level of welfare).

In perfect competition the marginal rate of substitution between

any two goods, a and b, is Pa/Pb or their relative price ratio.  The

marginal ratio of transformation is the ratio of marginal production

costs (MCa/MCb) which equals MRa/MRb or Pa/Pb.  Therefore, in the absence

of trade MRS equals MRT for each country.  Assume the world consists of

two countries, the home country, 1, and the foreign country, 2.  Assume

increasing costs in both industries in both countries.  Figure II.2 illus-

trates the pre trade and post trade situations for the two countries.

16.  Some standard reference works on the gains from trade are C. P.
     Kindleberger, International Economics, 5th Ed., 1973, Chapter 3;
     M. Chacholiades, The Pure Theory of International Trade, 1973,
     Chapters 5 and 16; R. N. Batra, Ch. 4.
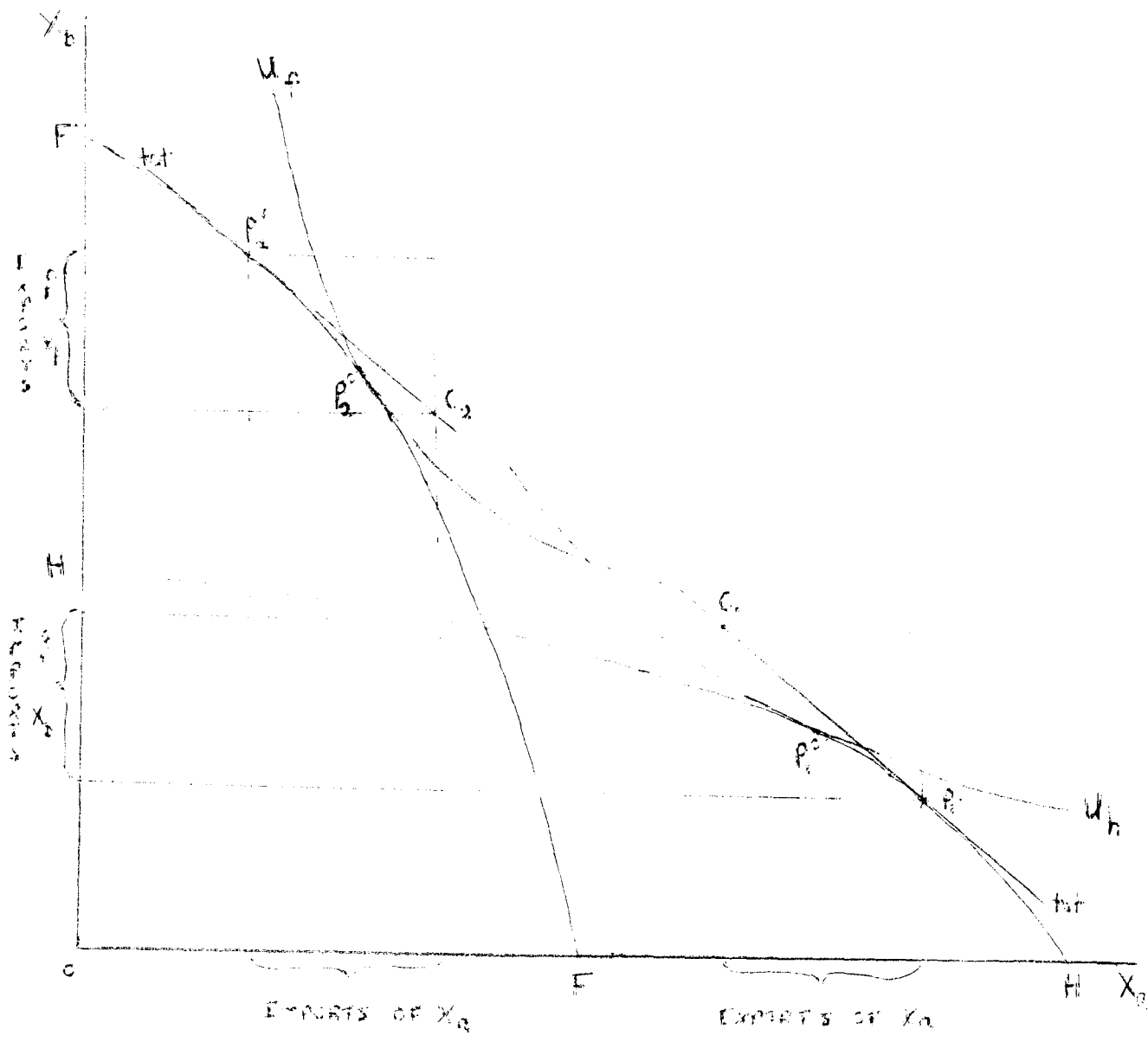
Figure II.2 shows the possible output combinations of Xa and Xb that could be produced by either country. FF is the production possibilities curve facing country 2 and HH, the curve facing country 1. In the pretrade situation country 1 is consuming and producing at $P_1^o$ where $MRS_1 = MRT_1$ and country 2 at $P_2^o$ where $MRS_2 = MRT_2$. Note that $MRS_2$ exceeds $MRS_1$, that is, the relative price ratio is higher in country 2. When trade opens the commodity price ratios move toward each other and are equalized where the terms of trade equal each country's marginal rate of transformation now also equalized. Country 2 therefore moves from $P_2^o$ to $P_2^1$, producing less of Xa and more of Xb (in which it has a comparative advantage since $MRT_2$ exceeds $MRT_1$ in the pretrade situation). Country 1 moves from $P_1^o$ to $P_1^1$, producing more of Xa (in which it has a comparative advantage) and less of Xb. The volume of trade is determined by comparative advantage, trade opening until the exports of each country equal the desired imports of the other country. Final consumption points occur at $C_1$ and $C_2$ where country 1's exports of Xa equal country 2's imports of Xa (and similarly for Xb). Each country exports the good in which it has a comparative advantage and imports the other good. Each country has moved outside its transformation curve and now consumes a larger bundle of goods. Both countries move to higher indifference curves. Trade increases the welfare of both countries.

This, then, is the standard argument for free trade--all countries gain from trade since through trade, each can move outside the boundaries of its transformation curve and therefore reach a higher level of welfare. However, in the presence of distortions free trade may not be superior to no trade. Where commodity markets are monopolized Batra has shown one country may move to a lower level of welfare if it engages in trade.[17]

17. R. N. Batra, pp. 296-301.

Let us assume that a multinational enterprise has a monopoly in production of Xa in both countries. The markets for Xb are still perfectly competitive. The marginal rate of substitution in each country is the relative price ratio Pa/Pb. The marginal rate of transformation is MCa/MCb which equals MRa/MRb. Since Xa is produced under a monopoly, MRa is less than Pa. The marginal rate of transformation in each country MRa/Pb will therefore be less than the marginal rate of substitution in each country and the demand elasticity of Xb exceeds Xa.(Batra p. 291)

Assume the second commodity, b, is the numeraire so that Pb = 1. Therefore $MRS_1$ = $Pa_1$ and $MRS_2$ = $Pa_2$ (the MRS in each country equals the price of good a in terms of b). Also $MRT_1$ = $MRa_1$ and $MRT_2$ = $MRa_2$ (the MRT in each country equals the marginal revenue of good a in terms of b). To determine whether trade will occur we must therefore compare $MRS_1$ with $MRS_2$. Assuming $Pa_2$ exceeds $Pa_1$ this implies $MRS_2$ exceeds $MRS_1$ but does not determine whether $MRT_1$ exceeds, equals, or is less than $MRT_2$.

Turning to figure II.3 country 1 initially produces and consumes at $P_1^o$ where $MRS_1^o$ exceeds $MRT_1^o$. Country 2 produces and consumes at $P_2^o$ where $MRS_2^o$ exceeds $MRT_2^o$. Both are on the highest indifference curve that each can reach, $U_f$ for the foreign country and $U_h$ for the home country.

If the multinational corporation cannot price discriminate between the two markets, the volume of intrafirm trade is determined by the condition for maximizing profits of a multiplant discriminator--$MCa_1$ = $MCa_2$ = $MR(Ya_1 + Ya_2)$. The firm equates the marginal production cost in each plant to the marginal revenue of total sales. (See Appendix II.5). In terms of our analysis when the MNE equates $MCa_1$ to $MCa_2$ this also equates $MRa_1$ to $MRa_2$. That is, intrafirm trade results in equalizing the marginal rates of transformation between the two countries. Both countries produce

Figure II.4



Figure II.4
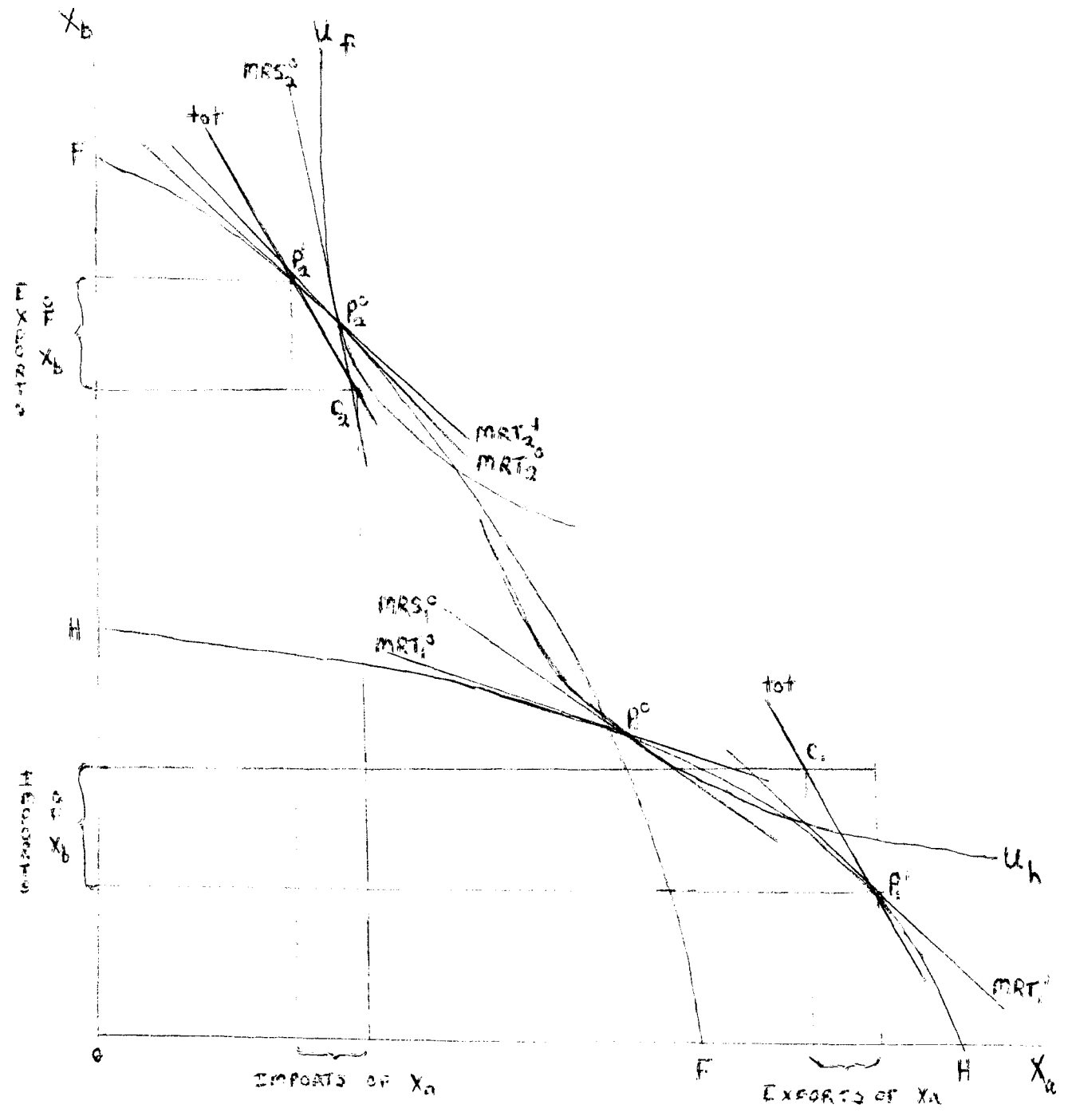
where $MRT_1^1 = MRT_2^1$ (at $P_1^1$ and $P_2^1$). Country 2 produces less of Xa and more of Xb since $MRT_2$ exceeded $MRT_1$ in the pretrade situation. Country 1 produces less of Xb and more of Xa in which it has a comparative advantage (assuming $MRa_1 < MRa_2$).

With the opening of trade $Pa_1$ will also equal $Pa_2$ so that $MRS_1 = MRS_2$, if the corporation cannot price discriminate as represented by the new terms of trade line, "tot".

The final consumption point is determined by moving along the terms of trade lines until the volume of exports offered by each country equals the volume of imports demanded by each country. Country 1 moves outside its transformation curve (onto a higher indifference curve) and consumes at $C_1$, exporting good a and importing good b. Country 2, however, moves inside its transformation curve to $C_2$ and a lower indifference curve. This is the point made by Batra that "if a country exports the commodity with the higher elasticity (in autarky) free trade may be inferior to no trade."[18] Here country 2 is exporting good b produced in perfect competition while Xa is produced under monopoly conditions. Country 2 is exporting the commodity with the higher elasticity. If the terms of trade had been flatter (that is, the fall in $Pa_2$ much larger) $C_2$ might have been outside of UU so that country 2 would have attained a higher level of welfare. Or if the fall in production from $P_2^o$ to $P_2^1$ had been small, the consumption gain might have outweighed the production loss.

In summary, if one industry is owned by a multinational and the others are perfectly competitive, the country that exports the commodity produced by the MNE will gain from trade. The country that imports the MNE good may lose; the loss being larger the greater the fall in production

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18. R. N. Batra, p. 300.

of the monopolized good and the smaller the fall in its price. Where
the multinational can price discriminate between countries the marginal
rates of substitution will move toward each other but will not be equalized.
Since the changes in relative prices are smaller the volume of trade flows
will be less. (See Appendix II.5) The production points $P_2^1$ and $P_1^1$ are not
affected by the assumption of price discrimination, only the consumption
points. Since this implies $MRS_2^1$ will be steeper than "tot", welfare losses
are more likely to occur in country 2. In country 1 $MRS_1$ will be flatter
than "tot" and the welfare gains smaller. That is, if the corporation
can perfectly price discriminate, both countries suffer compared to the
no discrimination situation. This is an additional welfare loss to the
one caused by monopoly alone, (that is, that MRT does not equal MRS).
Note that the transfer price has no effect in the welfare gains or losses
under intrafirm trade.

<div align="center">

The Division of Trade Gains Among

Producers, Consumers and Factors

</div>

Assuming that there is no government there are three basic
groups that can gain from intrafirm trade;

1) the MNE gains if pure profits are increased;

2) consumers gain if consumer prices are reduced;

3) factors gain if their real incomes are increased.

Let us examine each of these gains separately.

First there must be producer gains from trade as an incentive
for the MNE to move to a trading position. Three separate cases can be
recognized:

1) The move to trade by making $MR_1 = MR_2$ and $MC_1 = MC_2$ automatically equates MR with MC. No further changes in output or sales occur so that total output and sales are unchanged by trade.

2) The move to trade causes output and sales to expand.

3) The move to trade causes output and sales to contract.

In each of these three cases total corporation profits are larger after trade than before trade. The first case is illustrated in Figure II.4

In Figure II.4 firm 1 produces and sells where $MR_1$ and $MC_1$ intersect at 'e' while firm 2 produces and sells where $MR_2$ and $MC_2$ intersect at 'b'. By adjusting the allocation of sales only the MNE can make more profits by shifting sales into the high marginal revenue market and out of the low revenue market. In Figure II.4 the corporation reallocates sales until $MR_1 = MR_2$ at levels 'a' equals 'd'. ($+\Delta Y_2 = -\Delta Y_1$.) The increase in total revenue from this shift is measured by the increase in total revenue from sales in market 2 minus the fall in total revenue from sales in market 1. Total revenue can be measured as the area under the MR curve over the relevant range. Since the fall in $Y_1$ equals the rise in $Y_2$ the loss in total revenue in market 1 (equals $-de\Delta Y_1$) can be transposed into market 2 and relabelled as $+ae'\Delta Y_2$. Since firm 2 had the high revenue market initially by assumption there must be a net gain in total revenue from the move to intrafirm trade. This gain is $ab\Delta Y_2$ minus $ae'\Delta Y_2$ or the triangle abe'. This triangle represents the increased gain to the corporation from equating $MR_1$ and $MR_2$.

By adjusting only the allocation of output the MNE can increase its profits by shifting production to the low cost firm from the high cost firm. The corporation reallocates output until $MC_1$ equals $MC_2$ at the levels 'c' equals 'f'. ($+\Delta X_1 = -\Delta X_2$.) Total cost of production in firm

Figure II.4
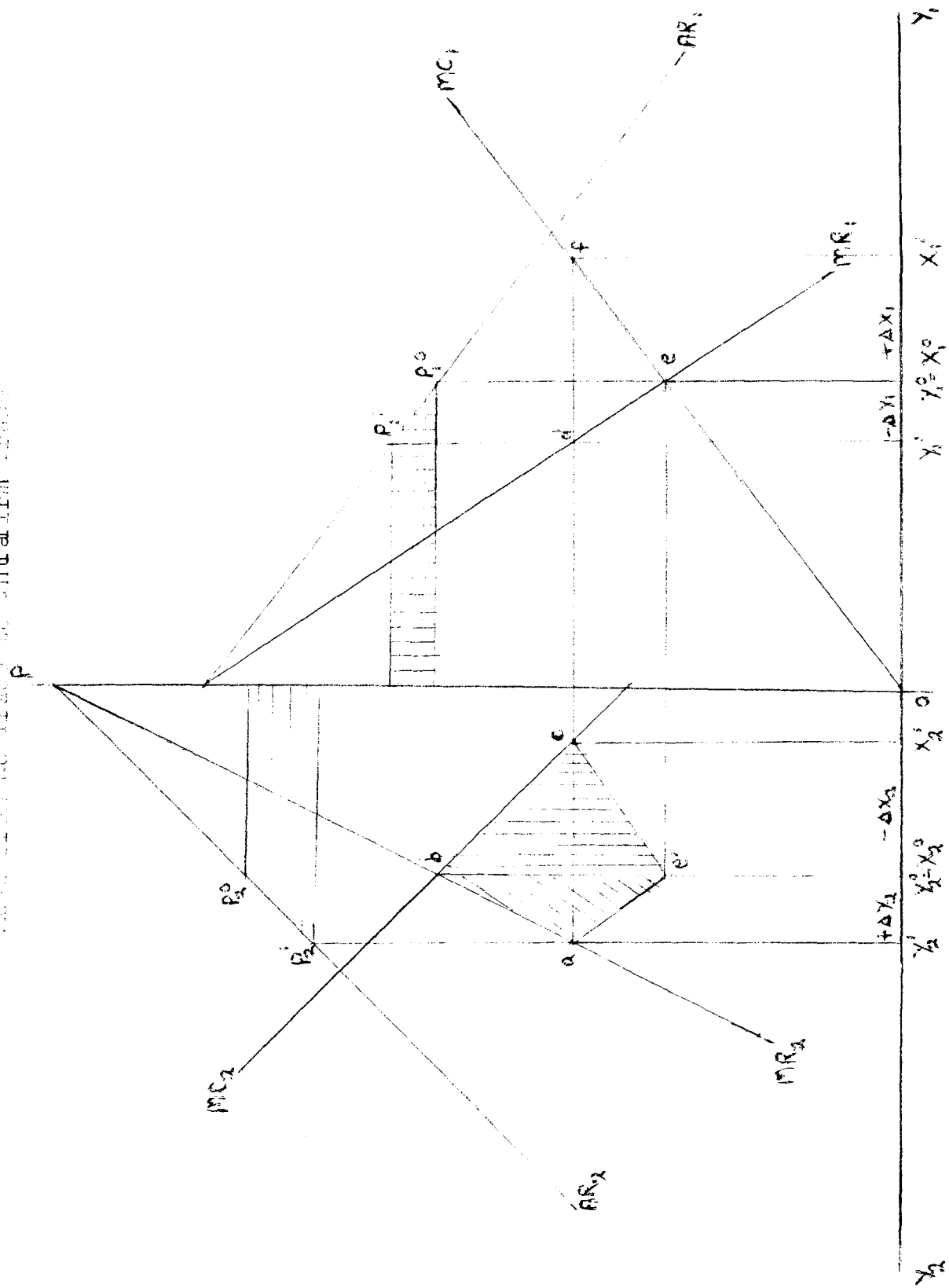
2 falls by the area under the $MC_2$ curve over the range $-\Delta X_2$, and rises in firm 1 by the area under $MC_1$ over the range $+\Delta X_1$. This fall in cost in firm 2 is shown in Figure II.4 as $-bc\Delta X_2$ while firm 1's costs increase by the area $+ef\Delta X_1$. Since we initially assume firm 1 to be the low cost firm total costs of the corporation fall by the triangle bce' (transposing firm 1's costs into the left graph).

Therefore total profits rise by the area abce' when the corporation engages in trade. Since at this level the equalizing of $MR_1$ and $MR_2$ and of $MC_1$ and $MC_2$ automatically equates MR with MC there are no further producer gains from trade. That is, in the first case there are two sources of producer trade gains, the first, an increase in total revenues, and the second, a decrease in total costs. In the cases where MR does not equal MC and further reallocations are necessary that cause output and sales to rise or fall total profits are also increased by a move to equate MR and MC. In these two cases there is a third producer gain arising from equating $MR_1 = MR_2$ with $MC_1 = MC_2$. These producer gains are unambiguous, depending only on the pretrade level of costs and revenues and not on the shapes of the curves.

The second source of gains from intrafirm trade is consumer gains from a net lowering of prices and therefore an increase in consumer surplus. Figure II.4 can also be used to show the changes in consumer surplus under trade. Before trade firm 1 was selling $OY_1^o$ at $P_1^o$; after trade the firm sells $OY_1^1$ at $P_1^1$. Firm 2 had sold $OY_2^o$ at $P_2^o$ and now sells $OY_2^1$ at $P_2^1$. Consumers in country 1 suffer a loss in consumer surplus of the cross-hatched area under the $MR_1$ curve over the range $P_1^o$ to $P_1^1$. Consumers in country 2 realize a gain of the horizontally striped area under the $MR_2$ curve over the range $P_2^1$ to $P_2^o$. There appears to be no obvious reason

why the gain to consumers in country 2 should outweigh the loss to consumers in country 1 and therefore there may be either a net gain or net loss in consumer surplus under intrafirm trade.  This gain or loss is determined by the elasticities involved, the prices, the total original sales, and changes in sales after trade.[19]  Consumer surplus will also be affected if total output and sales expand, contract, or remain unchanged after trade.  If sales are unchanged, the areas shown in Figure II.4 are the correct consumer surplus gains and losses in consumption of the monopolized good.  If, however, total sales expand after trade, net consumer gains will _ceteris paribus_ be somewhat larger or losses somewhat smaller than in the first case.  If total sales contract, losses will be larger or gains smaller.  These  are  the final changes in consumer surplus that occur due to  changes in the prices and quantities of all goods consumed in each country.

The third type of trading gain is gains to factors. With perfect factor markets changes in firm output or sales do not affect factor prices.  A reallocation of output from the high cost firm to the low cost firm will cause factors to be released in the high cost firm and to be hired in the low cost firm.  The released factors will find reemployment at home at the same factor price (or, in the case of capital, some may move abroad) and therefore factor incomes are unchanged.  In perfect competition the low cost firm can draw factors away from other firms without affecting

---

19.  The fall in consumer surplus in country 1 can be measured as $\Delta P_1 Y_1 + \frac{1}{2}\Delta P_1 \Delta Y_1$ which, in terms of the elasticity of demand, E, can be rewritten as $\Delta Y_1 P_1 (1 + \frac{1}{2}\Delta Y_1/Y_1)/E_1$.  The gain in consumer surplus in country 2 can be written as $\Delta P_2 Y_2 + \frac{1}{2}\Delta Y_2 \Delta P_2$ or in terms of $E_2$ as $\Delta Y_2 P_2 (1 + \frac{1}{2}\Delta Y_2/Y_2)/E_2$.  Although we know $+\Delta Y_2 = -\Delta Y_1$ the net change in consumer surplus also depends on the initial prices and sales and the price elasticities of demand.

factor prices or factor incomes. Therefore in perfectly competitive factor markets we can conclude that although intrafirm trade causes a reallocation of factors, factor prices and factor incomes are unaffected by this movement. If intrafirm trade causes a net expansion of corporate output (MR exceeds MC), the ratio of factors employed by the corporation to total factor supply will rise but without affecting factor price. Similarly if total output falls total factor demand by the corporation declines.

If the factor market is not perfect and the corporation can affect factor prices, factor incomes will be affected depending on 1) the elasticity of factor supply, 2) the ease of factor substitution, and 3) the volume of factors released by the contracting firm compared to the volume hired by the expanding firm. If the contracting industry faces a more elastic factor supply curve than the expanding industry, ceteris paribus, factor incomes will tend to rise after trade. This is more pronounced if output expands and less pronounced if total output declines. The smaller the ease of factor substitution in the expanding firm compared to the contracting firm, ceteris paribus, the higher the rise in prices of factors. If the net volume of factors released (ie. factors released by the contracting firm minus those hired by the expanding firm) is negative, ceteris paribus, factor incomes increase after trade. In general then under perfect competition in factor markets factor incomes are unaffected by intrafirm trade. Under imperfect competition conditions of factor supply and factor demand become relevant.

In summary, there are three possible groups who can gain from intrafirm trade--the corporation, consumers, and factors. It is always true that the producer gains from trade. However, it is not clear that

consumers and factors must do so. This then provides a rationale for government intervention to redistribute the gains more evenly. The following chapters examine various government tax and trade policies designed to increase government's share in intrafirm trading gains at the expense of the corporation.

### The Distribution of Group Gains Between Countries

This section examines how the three gains from trade, producer, consumer, and factor gains , are allocated between the two firms and the two countries.

Consumer gains from intrafirm trade are made only by consumers in the high revenue market while consumers in the low revenue market face losses in surplus. In terms of Figure II.4 consumers in country 1 buying the product of firm 1 suffer a loss in surplus caused by the price rise. Consumers of firm 2's product realize a gain in surplus as price falls. Depending on the substitutability and complementarity of these goods with other consumer goods these gains or losses may be large or small.

Under perfect factor competition there are no factor gains or losses between countries. More factors are employed by the expanding firm and fewer by the contracting firm so that factor allocation changes. In imperfect competition the intensive factor is harmed absolutely and relatively in the contracting industry and benefitted in the expanding firm.

The division of producer gains from trade is the only source of gain affected by the transfer price. When there are no barriers to trade the price charged in intrafirm sales does not affect total profits but it does affect the allocation of these profits between the two firms. (See Appendix II.4) If the transfer price is set above the average cost

of production in the exporting firm and below the final selling price of the importing firm both parties make gains on intrafirm trade. If the price is set equal to average cost of the exporter all trading profits are declared by the importer. If the price is set equal to the final selling price, all profits are recorded by the exporter. Total profits are unchanged since the exporter and importer are the same corporate entity but the allocation of these profits is determined by the transfer price. If the price is below average cost of the exporter this firm declares losses on trade and the importer declares profits that include all the trade profits plus the losses declared by the exporter. Similarly a price above the final selling price allocates more than the total trade profits to the exporter. This is illustrated in Figure II.5.

In Figure II.5 the MR and MC curves of the firms are horizontally summed and their intersection determines total output and sales and the allocation of output and sales between the firms. Firm 1 produces $OX_1$, selling $OY_1$ for $P_1$ in the home market and $X_1 - Y_1$ to firm 2 at $Pm_2$ (equals $cX_1$ in the diagram). Firm 2 produces $X_2$ and imports $Y_2 - X_2$ at transfer price $c'X_2$, selling the total in the domestic market for $P_2$. As shown in Appendix II.4 firm 1's profits are $Y_1(P_1 - AC_1) + M_2(Pm_2 - AC_1)$. That is, firm 1 has two sources of profits; domestic profits equal to the volume of sales times the difference between sales price and average cost; and export profits equal to the volume of exports multiplied by the difference between the transfer price and average production cost. In Figure II.5 average production cost of $OX_1$ is $aX_1$ and this cost applies to both domestic and export sales. Firm 1's profits on domestic sales are therefore represented as the diagonally lined rectangle ($dP_1$ times $OY_1$). Export profits are the horizontally lined rectangle (ac times $M_2$).

Figure II.5

The Division of ~~sure~~ profits Between the Trading Firms
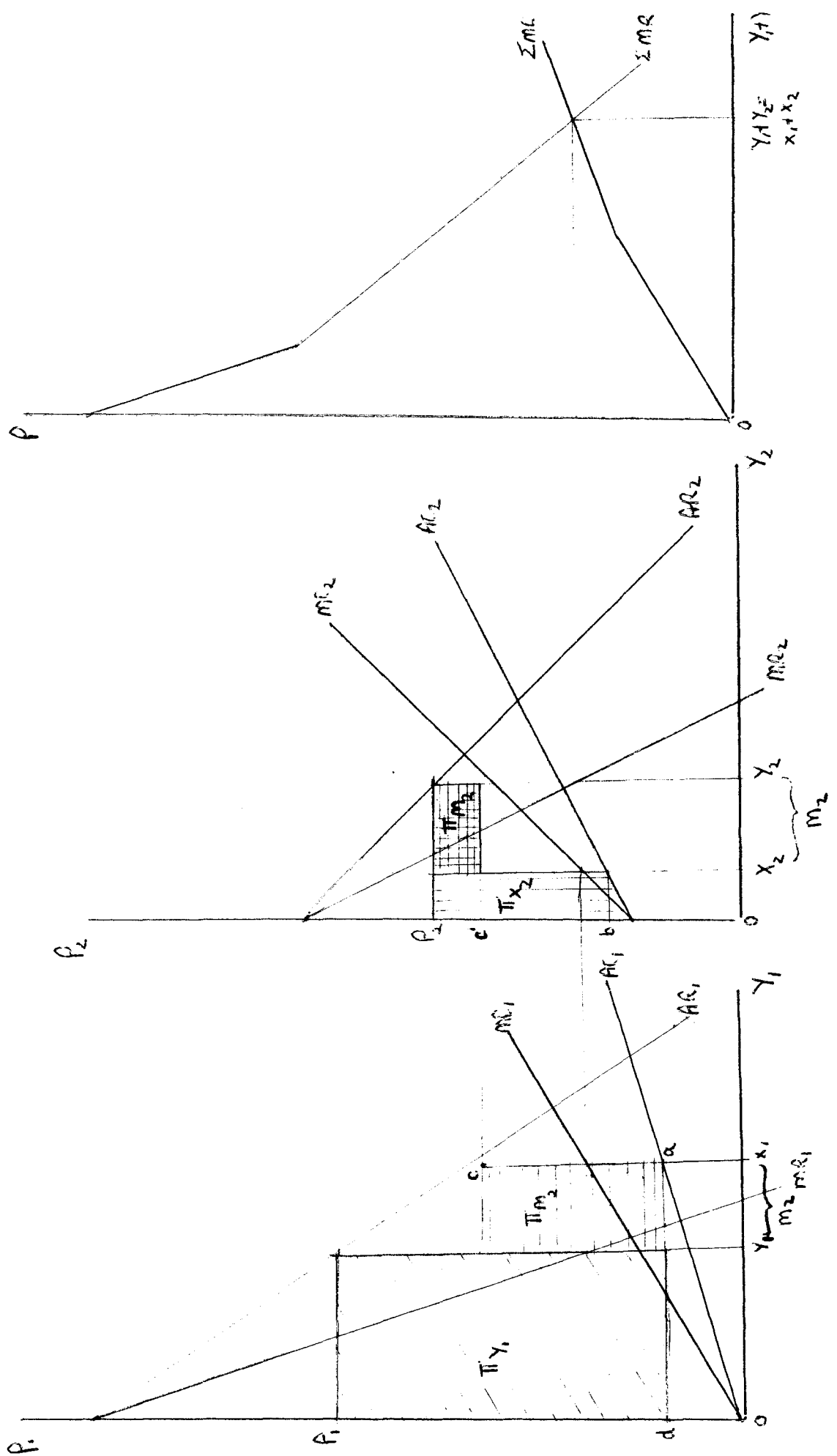
Firm 2's profits are $X_2(P_2 - AC_2) + M_2(P_2 - Pm_2)$; that is, the
per unit profit on domestic production multiplied by the volume of output
plus the per unit profit on imports times the volume of imports. Profit on
output is shown as the vertically striped area ($bP_2$ times $OX_2$); profit
on imports as the cross-hatched area ($P_2c'$ times $M_2$). Total corporate
profits would consist of three components: profits on $Y_1$, profits on $X_2$,
and profits on $M_2$. Total profits on trade are unaffected by the transfer
price.

The distribution of trade gains between consumers, factors and
firms may be viewed in another light as a distribution of national and
domestic income arising out of these firms. When there are no barriers
to trade the transfer price affects the division of income between the
two countries only in so far as it affects the division of producer profits.
Consumer and factor distributions are unaffected. Since the transfer
price will affect the division of income between the host and home countries
it may prove useful to examine more closely the distribution of national
and domestic income between the countries involved in MNE trade.

### The Income and Balance of Payments
### Effects of Intrafirm Trade

Firm 1's contribution to the domestic income of country 1 is
given by its value added, that is, by the value of final sales minus the
value of its intermediate purchases. Assuming intermediate costs arise
only from imports this income is $P_1Y_1 + Pm_2M_2 - Pm_1M_1$. This income is
broken into three parts, returns to labor employed by the firm, returns
to capital employed by the firm, and returns to the scarce factor, technology,

(or pure profits) which accrue to the owners of the firm. Domestic income created by firm 1 is therefore also $Pl_1L_1 + Pk_1K_1 + TT_1$.

Firm 2's contribution to the domestic income of country 2 is similarly $P_2Y_2 + Pm_1M_1 - Pm_2M_2$. This is broken into $Pl_2L_2 + Pk_2K_2 + TT_2$.

Firm 1's contribution to the domestic income of country 2 is zero and also firm 2's contribution to the domestic income of country 1 is zero.

Firm 1's contribution to the national income of country 1 depends on the nationality or residence of the owners of the firm and the factors employed by the firm. By assumption the firm is resident in country 1 so $TT_1$ is part of national income. Also by assumption labor is immobile across national borders so $Pl_1L_1$ is part of national income. Firm 1 may, however, employ some foreign capital whose returns are not counted in country 1's national income. Let '$a_1$' be the fraction of capital employed by firm 1 that is resident in country 1 and '$1-a_1$' the fraction employed by 1 but resident in country 2. Then firm 1 contributes $a_1Pk_1K_1$ of capital income to country 1's national income.

Firm 2's contribution to country 2's national income first consists of $Pl_2L_2$ since labor is immobile. Since firm 2 is owned by the MNE assumed resident in country 1 firm 2's profits accrue to firm 1. Most authorities in defining national income deduct dividends paid to nonresidents and include retained earnings plus national corporate taxes and dividends paid to residents. Let 'b' represent the fraction of firm 2's profits that is repatriated yearly to firm 1. $0 \leq b \leq 1$. When $b = 0$ no profits are remitted and all of $TT_2$ is counted as a contribution to country 2's national income. When $b = 1$ all profits are repatriated and this is counted as a contribution to country 1's national income. Factors that

affect the rate of repatriation will therefore affect the division of

national income between the countries. Also since capital is mobile

let '$a_2$' represent the fraction of capital employed by firm 2 that is

resident in country 2 and '$1-a_2$' the fraction resident in country 1.

Therefore firm 2's total contribution to the national income of country

2 is $Pl_2L_2 + a_2Pk_2K_2 + (1-b)TT_2$.

Firm 1's contribution to the national income of country 2

consists of the income accruing to capital employed by firm 1 but resident

in country 2 or $(1-a_1)Pk_1K_1$.

Firm 2's contribution to the national income of country 1 consists

of a capital income or return flow of $(1-a_2)Pk_2K_2$ and a repatriated profits

flow of $bTT_2$.

In summary the domestic income of country 1 arising in the MNE

is $Pl_1L_1 + Pk_1K_1 + TT_1$. Country 1's national income is $Pl_1L_1 + TT_1 + bTT_2 +$

$a_1Pk_1K_1 + (1-a_2)Pk_2K_2$. The domestic income of country 2 arising in the MNE

is $Pk_2K_2 + Pl_2L_2 + TT_2$ while the national income is $Pl_2L_2 + (1-b)TT_2 +$

$a_2Pk_2K_2 + (1-a_1)Pk_1K_1$.

Following the assumptions in Figure II.5 intrafirm trade will raise

the contribution of the MNE to country 1's domestic income and may raise

that income. If factor prices are unaffected by the increased output of

$X_1$ after trade an inflow of capital from abroad will raise country 1's

domestic income.[20] Since intrafirm trade will raise total producer profits

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20. If capital is perfectly (and equally) mobile within and between countries the increased output of $X_1$ will induce capital flows into that industry of both domestic and foreign capital. If capital is less mobile between countries than it is internally (due to government restrictions perhaps) this foreign inflow may not materialize. However, some economists have noted that capital appears to be more mobile within the same industry across national borders than between industries in the same countries. If capital is industry specific intrafirm trade will cause capital flows from the importing firm to the exporting firm. In this case, the external flows are likely to be larger than the internal flows.

of the MNE a transfer price can be chosen that will raise profits of both firms above no trade levels. If this transfer price raises firm 1's domestic profits then the domestic income of country 1 is increased by MNE trade. However, it is possible that the price may reduce profits and therefore cause country 1 to lose from intrafirm trade. If factor prices are affected they may tend to rise as output expands and this will also cause domestic income of country 1 to increase. Country 1's national income will tend to rise in so far as 1) factor prices rise, 2) firm 1's domestic profits rise, and 3) firm 2's profits rise and/or its remittance rate on profits rises. That is, domestic income rises insofar as factors flow in from abroad, factor prices rise, or profits increase. National income is affected by the last 2 factors and firm 2's profit.

The domestic income of country 2 may rise if increased profits on trade raise firm 2's profits above pretrade levels. If factor prices decline as $X_2$ falls or capital migrates to country 1, domestic income will decline. The share of total factor income arising in firm 2 falls as factors are released. National income of country 2 declines if 1) factor prices fall and 2) firm 2's profits fall.

In the pretrade situation, Balance of Payments transactions between the two firms consisted of capital flows and the repatriated profits flow from firm 2 to firm 1. When the firms engage in trade a third flow of commodities is added. Intrafirm trade moreover may be expected to cause a movement of capital from the contracting firm to the expanding firm, the size of that flow depending on what proportion of the released factors find reemployment at home and whether or not factor prices change. Intrafirm trade will increase producer's profits. If firm 2's profits increase,

a larger profit outflow may also be expected but is not certain. The

commodities flow goes from the expanding firm to the contracting firm

and the value of this flow depends on the transfer price set. Therefore

intrafirm trade will shift the Balance of Payments in favor of the exporter

assumed to be firm 1 and will set in motion forces designed to offset

these movements. If firm 2 is the exporter, country 2's Balance of Payments

is affected by 1) inflow of capital, 2) export earnings on intrafirm trade,

and 3) outflow of repatriated profits. The net effect may be either

positive or negative. This dissertation, however, ignores the transfer

problem since it is not central to the analysis and has been discussed

elsewhere.[21]

## Summary

In the presence of monopoly distortions the general presumption

in favor of free trade may not hold. The country exporting the monopolized

good will reach a higher community indifference curve but the country

importing the good may actually suffer a loss in welfare. Where the multi-

national can price discriminate between markets the terms of trade are

not equalized and the welfare gains are smaller. Intrafirm trade causes

the marginal rates of transformation to be equalized between countries

so that efficiency in resource use is increased.

There are three groups that may receive benefits from intrafirm

trade--the multinational, consumers and factors. The MNE unambiguously

gains larger profits. Although efficiency in resource use is increased

by trade all factors do not share in this unless there is a net rise in

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21. For discussion of the transfer problem see H. Johnson, _International
    Trade and Economic Growth_, 1958, chapter 7 and the readings cited in
    this chapter.

factor incomes after trade. There may be consumer gains or consumer
losses from trade. The distribution of producer gains depends on the
transfer price charged in intrafirm transactions. Intrafirm trade will
affect domestic income depending on its effects on the distribution of
profits, the movement of capital from one country to the other, and factor
prices. Intrafirm trade will affect national income depending on its
effects on the distribution of profits and factor prices. Intrafirm
trade will shift the Balance of Payments in favor of country 1 if firm 1
is the exporter. If firm 2 is the exporter the shift favors country 2 if
the goods flow and capital flow outweigh the profit flow to firm 1.

## Conclusions

This chapter has developed a model of a perfectly discriminating
multinational enterprise consisting of two firms located in different
countries. Both firms are assumed to have monopolistic control over
their markets. The MNE can price discriminate between the two markets
and will do so assuming the demand elasticities are determinate and
different. The firms employ two variable factors, labor and capital,
hired in perfectly competitive markets. The MNE also has a monopoly on
some form of technology which when used by the firms causes their cost
curves to rise as output increases. The cost curves facing the two firms
differ. The goal of the MNE is to maximize total profits. Profits will
be maximized when the enterprise equates the marginal revenues and marginal
costs of each firm. Where costs and revenues differ in the pretrade
situation profits will be maximized when the firms engage in trade. The
price charged in these transactions, the transfer price, will not affect
total corporate profits but will determine the allocation of these profits.

The welfare gains from trade are uncertain due to monopoly distortions. The multinational will unambiguously gain larger profits but consumers and factors gain only if goods prices fall and/or factor prices rise. The transfer price will affect the division of trade profits and therefore the contribution of the MNE to each country's income and to the Balance of Payments.

Chapter III

INTRAFIRM TRADE UNDER TARIFF BARRIERS

## Introduction

The Sharing of the Benefits from Intrafirm Trade

The previous chapter demonstrates that a profit-maximizing multinational enterprise, unconstrained by trade barriers or pricing regulations, will increase worldwide efficiency in the sense that marginal rates of transformation are equalized across countries. The welfare of the exporting country will be increased but this may be at the expense of a decline in welfare in the importing country. With regard to the groups affected by the intrafirm trade flows, the monopolist gains higher profits but the gains to consumers and factors are ambiguous.

If, as seems possible, most of the gains accrue to the multinational in the form of monopoly profits, governments are likely to intervene to redistribute the gains to themselves, to factors and to consumers. The host country cannot expect to capture the total gains of the multinational within its own country without government intervention since the monopoly profits constitute part of the national gains of the home country. Although the profits earned by the MNE in the host country may represent a fair return for the investment in knowledge undertaken by the corporation, the host government may fear that the profits are excessive and exploitive. It may therefore intervene to increase its share of the trade gains.

This point has also been made by Jack Behrman:

But it seems clear that the operations of MPE's do create
a particular sharing of its contributions to economic growth
and stability.  Some countries gain more than others.
The distribution of these gains is determined according to
the decisions made by the managers as to location of production,
produced mix, technological processes, location of R & D
efforts, trade and marketing patterns, pricing, and financial
flows.  The enterprises would prefer to make these decisions
without regard to diverse governmental interests and will
do so whenever they can....If governments do leave the enter-
prise free to operate across national boundaries without
constraint they are, in effect, accepting the distribution
of benefits as decided by the managers.  But governments
remain concerned over the distribution of the gains, and
few are willing to accept a division of international
welfare determined by the decisions of the MPE's, even if
their share might be larger than it otherwise would be.
They are concerned not only with the efficiency and the size
of their share but also with their participation in the
determination.[1]

Both home and host governments have interfered in the deter-

mination of the total gains and the division of gains between countries.

These total gains include both the benefits from the original  investment

and from intrafirm trade.  Mikesell outlines three areas in which govern-

ments have attempted to alter these benefits:[2]  1) the division of profits

from operations of the MNE, 2) the determination of export prices, output

and other conditions affecting total revenues, 3) the domestic impact of

foreign company operations on other sectors of the economy, on national

income and the Balance of Payments.  He notes that not only may the division

of revenues be a source of conflict but also the principle of maximization

of net revenues.  Host governments would prefer that subsidiaries and

branches behave as individual profit-maximizers.  The behavior of the

1.  J. H. Behrman, "Government Policy Alternatives and the Problem of
    International Sharing," in J. H. Dunning, The Multinational Enterprise,
    1971, pp. 292-3.
2.  R. F. Mikesell, "Conflict in Foreign Investor-Host Country Relations:
    a Preliminary Analysis" in R. F. Mikesell et al., editors, Foreign
    Investment in the Petroleum and Mineral Industries, 1971, pp. 29-55.

affiliate, however, will be to maximize not its own profits but the net income of the multinational enterprise as a whole. This may involve higher prices, smaller outputs or lower profits in the host country than would occur in the absence of trade.

One of the traditional policy tools used by governments to increase their country's share of the gains from trade has been the tariff. If a country can alter its terms of trade without retaliation, tariffs can redistribution trade gains in favor of the importing nation, stimulate growth and employment, and redistribute income internally in favor of the protected industry and the factor used intensively in that industry. This argument in favor of tariffs is outlined in the next section.

Tariffs and the Distribution of the Gains from Trade

This analysis borrows heavily from Kenen's[3] discussion of tariffs. By levying a tariff on imports a large country can alter the international terms of trade in its favor, gaining reduced import prices at the expense of some fall in total consumption (assuming the exporting country does not retaliate).

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3.  P. B. Kenen, "The Use and Abuse of Tariffs," in R. D. Hays, C. M. Korth, M. Roudiani, International Business, 1972, pp. 82-88.

Figure III.1

## THE IMPACT OF A TARIFF ON FIRM 2's IMPORTS
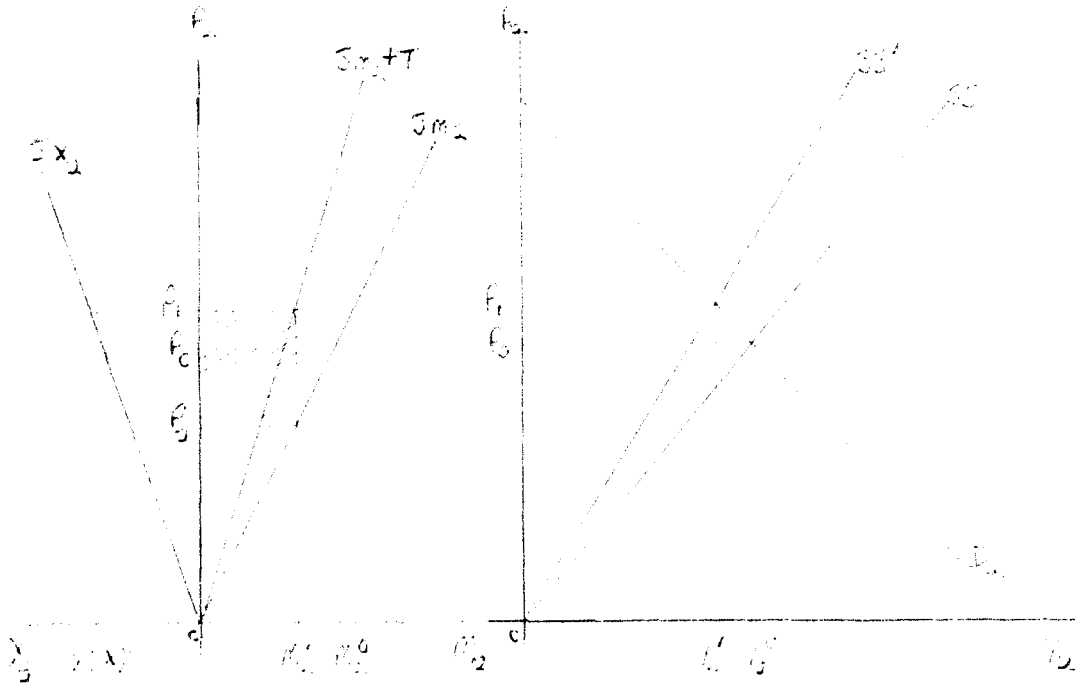


Figure III.1 in the left diagram, shows the domestic ($Sx_2$) and foreign ($Sm_2$) supply curves of a particular good, and, in the right diagram, the domestic demand curve and horizontally summed total supply curves. Initially the home country consumes $Y_2^o$ at $P_o$; obtaining $X_2^o$ from domestic sources and $M_2^o$ from imports. The world and domestic prices for the commodity are the same. The home government then levies a tariff on imports which causes the import supply curve to shift to $Sm_2 + T$ and the aggregate supply curve to rise to $SS^1$. This causes domestic sales to decline to $Y_2^1$ and the price to rise to $P_1$. Domestic production increases to $X_2^1$ while imports fall to $M_2^1$. The total price of imports is $P_1$ of which $P_2$ is the price paid to the foreign suppliers and $P_1 - P_2$ is the tariff revenue paid by the importer. Although the consumer price is higher and sales less, the country has obtained its imports at a lower cost, increased

its domestic production and generated tariff revenues for the government. The home country has captured a larger share of the gains from trade. Within the home economy the protected industry hires more factors and if factor markets are not perfect the tariff can raise incomes and employment.

In applying tariffs governments have usually assumed international trade consists primarily of transfers between unrelated buyers and sellers. The price at which trade occurs will be an arm's length price—a price negotiated on the basis of demand and supply between firms maximizing individual profits. In such cases, the trade price will fairly accurately reflect the value added by each party involved. In intrafirm trade, however, the transfer price may bear no relation to value added. Transfer prices are set internally within the MNE in such a way as to maximize global profits. When the corporation is faced by tariff barriers it will attempt to minimize tariff costs by setting low transfer prices. This, in effect, shifts the supply of imports curve on which the tariff is based. As a result the price paid to foreign suppliers may not decline as predicted by the traditional tariff model. Transfer prices, therefore, have an important role to play in determining the total gains from trade and the distribution of these gains under tariff barriers.

### The Role of Transfer Pricing

According to Business International: "The most complex aspect of pricing in international operations involves the determination of transfer prices for intercorporate sales, particularly when the separate corporations are domiciled in two or more countries."[4] Transfer pricing

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4. Business International Corporation, Solving International Pricing Problems, 1965, p. 18.

is a complex problem because any price must fulfill seven requirements.

It must:[5]

1) provide a fair profit to the producer.

2) enable the purchaser to meet profit targets.

3) permit management to compare and evaluate the performance of the various divisions.

4) reduce administrative costs.

5) be acceptable to tax authorities.

6) be acceptable to customs authorities.

7) provide control over foreign subsidiaries so profit targets are met.

Due to the large number of requirements Business International states that only four transfer pricing systems are acceptable:[6]

1) pricing at arm's length or an established price to unrelated customers.

2) prices negotiated between divisions.

3) local manufacturing cost plus a markup.

4) local manufacturing cost of the most efficient division plus a markup.

An arm's length price is the transfer pricing policy preferred by most governments. Arm's length pricing should allow each trading party a fair return on his investment and represent a "fair market value." Where both parties are perfect competitors an arm's length price will award each party the value added by his services. Where one or both parties are monopolists, however, "fair market value" is more difficult to define. The United States Treasury has outlined three standards that can serve as tests of arm's length prices:[7]

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5. Business International, p. 18.
6. Business International, p. 18.
7. U.S. Treasury, Section 482, "Allocation of Income and Deductions Among Taxpayers," 1968, page 32, 229.

1) comparable transactions with unrelated buyers.

2) uncontrolled resale price less a markup comparable to that made by

   the buyer in similar uncontrolled purchase and resale transactions.

3) full standard cost plus a markup reflecting the allocation of operating

   margin between buyer and seller.

In the model of the previous chapter where the parent firm

exports goods to the international division an arm's length charge

according to the first test would be $P_1$, the price at which the parent

firm sells the same product to unrelated customers. Under the second

test the transfer price would be $P_2$, the resale price, minus a discount.

The problem with the resale method is that firm 2 does not purchase the

good from outside parties, only from firm 1, so there are no comparable

uncontrolled sales. Under the third test full standard cost would be

$AC_1$ plus a markup reflecting the profit margin made by the seller on

uncontrolled sales. The allowable transfer price under the third test

would therefore be $AC_1[1 + (P_1 - AC_1)]$.

A study of 130 multinational enterprises[8] concluded that

most companies try to apply the arm's length standard in international

transactions. However, most actually use cost-plus or negotiated prices

depending on the availability of the product to the buying division

from outside sources. If the good can be purchased externally negotiated

transfer prices are used. If no outside sources are available cost-plus

pricing is followed. Business International also reports that most firms

construct a transfer price based on factory cost, with or without the

addition of indirect, administrative or R & D costs.[9] Most international

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8.  J. Greene and M. Duerr, _Intercompany Transactions in the Multinational_
    _Firm, A Survey_, The Conference Board, 1970, p. 21.
9.  Business International, p. 9.

divisions are organized as profit centers. For this reason, transfer prices tend to be arm's length charges, according to Brooke and Remmers.[10] Since transfer prices affect the allocation of profits among divisions an arm's length charge allows both buyer and seller to make a profit margin. Where transfer prices are set for other reasons profits can become a meaningless indicator of performance.

Transfer prices may be fixed or variable. A variable price fluctuates with changes in output ($AC_1$) or sales ($P_1$). A fixed or posted price is set at a level (for example $P_1$) and price changes are discontinuous and infrequent. Duerr[11] notes that several companies complain that the U.S. Internal Revenue Service expects rigid application of a transfer pricing formula regardless of changing conditions. Executives feel that transfer prices should be freely variable when market conditions vary. Posted or fixed prices were a common transfer pricing policy for petroleum multinationals. In the 1950's the oil companies signed 50/50 taxation arrangements with the OPEC countries.[12] The companies posted a uniform world-wide f.o.b. price for crude oil. The companies and OPEC agreed on the costs and 50 percent of the net profit was taxable by OPEC. The companies, however, sold the crude oil at less than the posted price to their affiliates. The posted price remained stable for several years while the price of refined petroleum products fluctuated with market conditions. The oil companies found it more and more difficult to maintain the posted price as market conditions changed and did succeed in renegotiating new posted prices. This

10. M. Brooke and H. L. Remmers, The Strategy of Multinational Enterprise: Organization and Finance, 1970, p. 117-118.
11. M. G. Duerr, Tax Allocations and International Business, The Conference Board, 1972, p. 60.
12. E. T. Penrose, The Large International Firm in Developing Countries, 1968, pp. 69, 177.

illustrates the difficulty of maintaining a truly fixed transfer price.

Generally, prices will vary with market conditions but probably not as

smoothly or quickly as is assumed in this dissertation.

One of the seven requirements of a workable transfer pricing

policy is that it be acceptable to customs authorities.  Since this

chapter studies the effects of tariff barriers on intrafirm trade it is

perhaps useful to outline the Canadian and United States tariff regulations

as they apply to intrafirm transfers.

Canadian Customs in section 36 of the Customs and Excise Act[13]

requires that all imports be priced at fair market value in the exporting

country.  This value is the price at which goods are sold to purchasers

at arm's length at the same trade level as the importer and in the same

quantities for home consumption under competitive conditions in the

exporting country.  If the goods are valued at less than foreign fair

market value dumping charges can be levied on the company.  In terms of

our model if the Canadian firm is firm 2, the importer, the transfer

price acceptable to Canadian customs would be $P_1$, or a price somewhat

less than $P_1$ since firm 1 is a monopolist in its domestic market.

Business International[14] notes that approximately half the firms inter-

viewed reported that customs authorities in Canada, Latin America , the

United Kingdom and the E.E.C. refused to accept transfer prices less

than arm's length distributor prices and had revalued their prices from

10-50 percent of the invoiced price.  Duerr[15] states that Canadian customs

valuation is considered an acceptable transfer pricing policy by the U.S.

13.  Department of National Revenue, Customs and Excise, Memorandum D43, Ottawa, March 20, 1972, "Information for Exporters to Canada," pp. 7-8.
14.  Business International, p. 23.
15.  M. G. Duerr, p. 30.

Internal Revenue Service but that it may not be acceptable to Canadian

income tax authorities since the high import price reduces profits (and

therefore income taxes) of the Canadian subsidiary. Another important

facet of the Canadian Customs Act is the treatment of branches compared

to subsidiaries. According to the Tax and Trade Guide: Canada[16]

Canadian branches are not required to pay foreign fair market value for

imported goods. Canadian customs do not consider transactions between

foreign parents and Canadian branch plants to be sales so that any

transfer price may be charged without leading to an antidumping charge.

This peculiar regulation means that subsidiaries must pay foreign fair

market value while branches could conceivably pay a zero transfer price.

Where tariff barriers are high and the affiliate a large importer tariff

costs could be considerably reduced by altering the form of business

organization from a subsidiary to a branch.

In the United States dumping charges may be levied if the

imported price is less than the factory price to consumers in the country

of exports. If less than 25 percent is sold domestically the test is the

factory price for exports to countries other than the U.S.[17] The United

States also has special tariff provisions. One such provision is the

American Selling Price (ASP) basis of valuation for certain chemical

imports.[18] The basis for tariff valuation is the price prevailing in

the U.S. market (ie., $P_2$, in our analysis). This price is generally

higher than the price the exporters charge and therefore affords more

protection to the U.S. industry. Another special provision is sections

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16. Tax and Trade Guide: Canada, 3rd Edition, Arthur Anderson and
    Company, August 1973, p. 16.
17. R. Robinson, International Business Management, 1973, p. 125.
18. S. H. Robock and K. Simmonds, International Business and Multinational
    Enterprises, 1973, p. 109.

806.30 and 87.00 stating that articles assembled abroad using U.S. components only pay duty on the value  added abroad rather than the total value of the good.[19]  Higher transfer prices for the U.S. components result in low U.S. tariffs that encourage U.S. firms to assemble components abroad rather than at home.

Similar tariff provisions were applied by the EFTA countries.[20] The tariff was based on the percent of value added to products imported from outside and then transferred among the members.  If less than 50 percent of the value was added internally a duty was applied.  This encouraged low transfer pricing to the EFTA subsidiary in order to raise the value added by the subsidiary.

In summary, transfer prices are often set in response to external pressures on the multinational enterprise.  Where tariffs are levied on imports the MNE attempts to lower the transfer price in order to escape the duty.  In response to this practice many customs authorities now demand arm's length pricing.  This pricing results in higher tariff duties but it can distort the behavior of the MNE in its output, sales and consumer pricing decisions.  The standard analysis of tariffs may not hold when transfer pricing is involved.  Therefore, having outlined the problem, let us turn to the model itself.

19.   D. Robertson, "Trade Flows and Trade Policy," in J. Dunning, editor, The Multinational Enterprise, 1971, page 185.
20.   E. Kolde, International Business Enterprise, 1968, p. 408.

## Profit Maximization Under the Tariff

### Assumptions

The assumptions of Chapter II are maintained: the MNE consists
of two horizontally integrated firms producing identical final products
in different countries. The firms can engage in trade and can price
discriminate between markets. This chapter also assumes that country
2 levies a tariff on all imported goods at an ad valorem rate 'r'. Firm
2 must therefore pay $rPm_2M_2$ to its government in tariff payments.[21] If
the transfer price is constant the per unit tariff will not vary with
the volume of trade. However, a variable transfer price will be affected
by trade flows. In general, the corporation will attempt to minimize
tariff costs by setting a low transfer price. If this is prevented by
government action or other constraints intrafirm trade may decline,
cease, or even increase.

### Profit Maximization with a Fixed Transfer Price

When there are no trade barriers the transfer price does not
affect total profits or the allocation of resource inputs between the
firms. Under a tariff, however, both profits and resources are affected
by the transfer price. Since this price affects the gains from trade and
the division of these gains both governments will be keenly interested in
the reactions of the MNE to the tariff.

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21. It is possible that the price charged by firm 1 for its exports will
    not be accepted by the tariff authorities and they then set a higher
    or lower price. Firm 2 then pays $Pm_2M_2$ to firm 1 and $rPm_2'M_2$ to the
    tariff authorities where $Pm_2$ and $Pm_2'$ differ. In order to simplify
    the analysis assume that the tariff rate includes this readjustment
    of transfer prices so that $Pm_2$ is the price charged by firm 1 and
    $rPm_2$ is the per unit tariff cost where r is adjusted for discrepancies
    between the internal price and the price accepted for tariff purposes.

As shown in Appendix III.1 the first order condition for profit maximization with a fixed transfer price is $MR_1 + rPm_2 = MC_1 + rPm_2 = MR_2 = MC_2$. The transfer price only enters into the condition when it is the price of exports from country 1. When firm 2 is the exporter the tariff does not apply and therefore the condition for profit maximization is the same as the no trade barrier one : $MR_1 = MC_1 = MR_2 = MC_2$. Since we are interested in the effect of the tariff on trade, initially the exporter is assumed to be the first firm.

The tariff can be viewed as a composite of (a) a tax on all of firm 1's output and (b) a simultaneous, equal subsidy on that part of that output that is sold within country 1. Alternatively , it can be viewed as a composite of (a') a tax on all of firm 2's sales , and (b') a simultaneous, equal subsidy on that part of such sales that is met from production within country 2. If we view it in this alternative manner the profit condition could have been written as $MR_1 = MC_1 = MR_2 - rPm_2 = MC_2 - rPm_2$.

Figure III.2 illustrates the effect of the tariff on output, sales, and prices of the two firms. Joint profits are initially maximized where $MR_1 = MC_1 = MR_2 = MC_2$, that is, where the summed MC and summed MR curves intersect. Firm 1 produces $OX_1^o$ , selling $OY_1^o$ in the domestic market for $P_1^o$ and selling $X_1^o - Y_1^o$ to firm 2 at $Pm_2$. Firm 2 produces $OX_2^o$ , imports $Y_2^o - X_2^o$ from firm 1, selling the total for $P_2^o$ . The tariff can be interpreted as shifting the $MR_1$ and $MC_1$ curves vertically upward by $rPm_2$. The new summed MR curve is found by horizontally summing the $MC + rPm_2$ and $MC_2$ curves. Where these two summed curves intersect fulfills the two necessary conditions for profit maximization : 1) all

output is sold, 2) $MR_1 + rPm_2 = MC_1 + rPm_2 = MR_2 = MC_2$. This new intersection may lie to the right, to the left, or directly above the old intersection. The conditions under which output and sales expand, or contract are examined in Appendix II.3.

The new allocation of output can be found by horizontally running across from the intersection of $\Sigma MR'$ and $\Sigma MC'$ to the $MC_2$ and $MC_1 + rPm_2$ curves. The allocation of sales is found by tracking back to the $MR_1 + rPm_2$ and $MR_2$ curves. The tariff causes firm 1's domestic sales to expand (tariff acts as a subsidy to sales) and output to decline (tax on output). Firm 2's sales contract and output expands. The volume of intrafirm trade declines. Consumers pay a lower price for the product in country 1 and a higher price in country 2. The shaded area $abM_2'$ represents the tariff paid to the government of country 2. This revenue is smaller than the revenue that the MNE would have paid (the area $cdM_2^o$) had it ignored the effect of the tariff on profits and not altered its allocation decisions.

The tariff is, apparently, non neutral with respect to the overall profit-maximizing output/sales decision of the international corporation. It also changes the location of production and sales decisions. Specifically, it encourages an expansion of output in country 2, combined with a reduction in aggregate sales, hence reducing 2's import demand. The reflection of these changes in firm 1 is that its exports decline, with domestic sales increasing and domestic production declining. From an output viewpoint the effect of the tariff is to encourage the corporation to undertake greater productive activity in country 2. From a sales viewpoint the tariff causes a reallocation of total sales in favor of country 1.

Figure III.2

Profit Maximization With a Fixed Transfer Price Under a Tariff Barrier
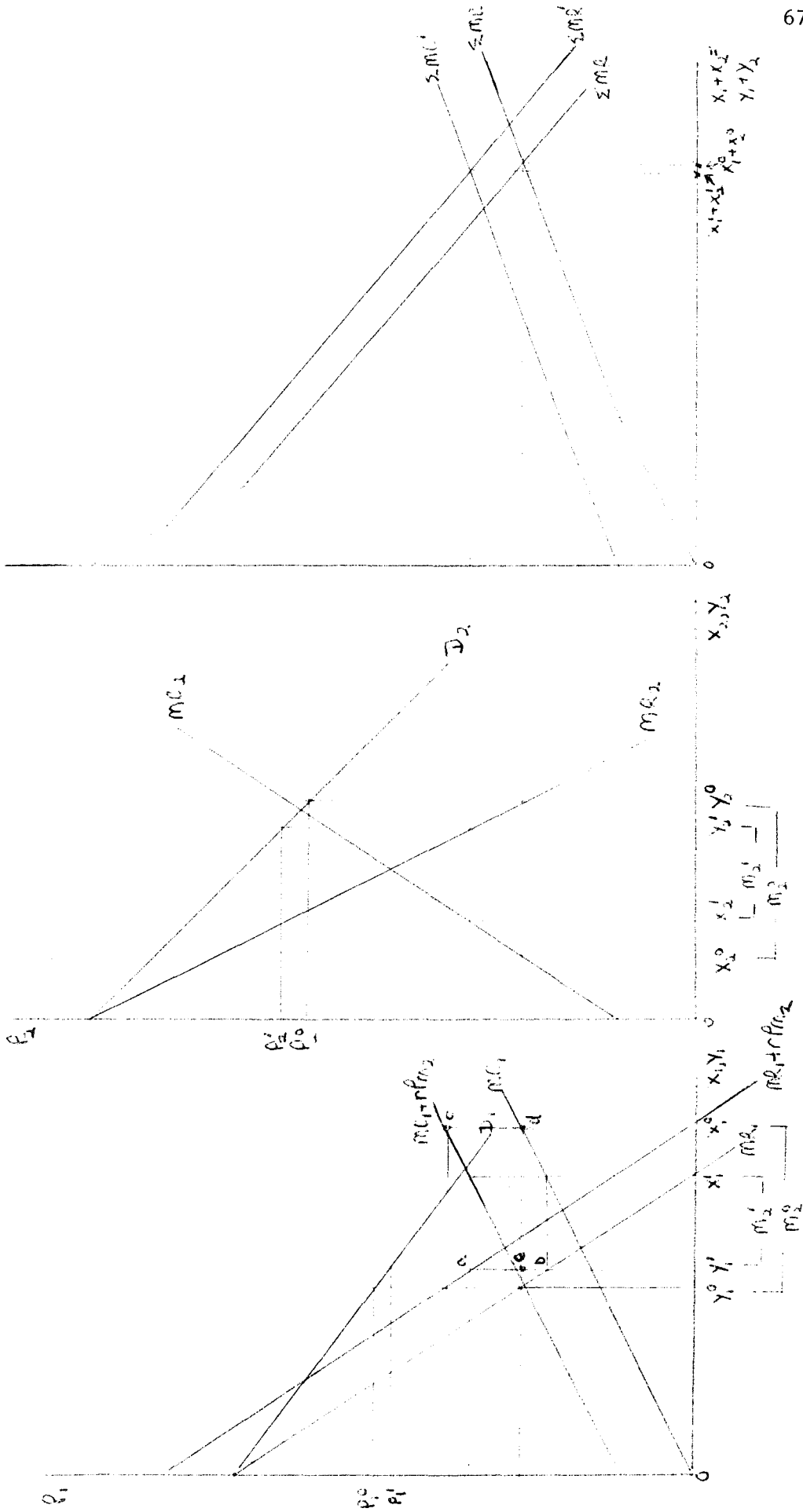
Comparing these results with the results of the standard argument in favor of tariffs (see Figure III.1) we note that, in both cases, the importing country sells less at a higher price; produces more domestically and imports less. Part of the tariff costs are shifted to the exporter so that his return falls to $Pm_2$ minus "eb" in Figure III.2. Firm 2 pays the remaining tariff cost "ea" plus $Pm_2$. By shifting part of the tariff incidence onto firm 1 country 2 manages to obtain its imports at a lower cost. If firm 1 reduces its transfer price in order to avoid the tariff, the costs to country 2 fall further. The lower the transfer price the smaller the upward shifts in $MR_1$ and $MC_1$ and therefore the less disturbance to the initial distribution of output and sales.

If the customs authorities insist on an arm's length transfer price the shifts in $MC_1$ and $MR_1$ are larger. The volume of trade contracts further and trade may cease altogether. This prohibitive tariff causes trade to cease when the intersection of $MR_1 + rPm_2$ with $MC_1 + rPm_2$ occurs at or above the level where $MR_2$ and $MC_2$ intersect. At this level firm 1 is no longer the 'low-cost--low revenue' firm. However, since the tariff only applies when trade flows from 1 to 2 trade cannot reverse direction due to the tariff. The MNE, if under no constraints, would prefer a zero transfer price since this minimizes tariff cost.

Profit Maximization with Variable Transfer Prices

This section discusses the effects of setting variable as opposed to fixed transfer prices on output, sales, and prices of the MNE.

Variable transfer prices may be set for many reasons. Customs authorities may require that imports be valued at the price the exporter sells in the home market to unrelated customers, at fair market value in

the port of origin. That is, the transfer price is based on $P_1$ when firm

1 is the exporter and therefore varies with $Y_1$. Or the transfer price

may be valued as the price of similar goods in the country of destination,

at the importing country's market price. In this case this would be $P_2$

and would therefore vary with $Y_2$. If firm 1 is treated as a service

center for firm 2 average cost pricing of exports may be used. This has

two effects: the transfer price varies with $X_1$, and all trading profits

are declared by the importing firm. Marginal cost pricing will allocate

some profits to each firm if costs are increasing. As seen in the intro-

duction, variable transfer pricing is common business practice. Although

price changes may be discrete changes and infrequent a study of continuous

price changes can yield some useful insights that may not be too far from

the truth. Since many governments now require that transfers take place

at 'fair market value' probable effects of these laws on the MNE and on

the countries involved should be studied.

Five variable transfer prices were chosen in order to illustrate

the effects of the tariff on intrafirm trade. These particular prices

were chosen as representative of actual business practices and government

regulations. These prices are (1) $P_1$ (2) $P_2$ (3) $AC_1$ (4) $MC_1$ (5) $AC_2$. The

transfer price might be set at the level of market price in either the

exporting or importing country because tariff or tax laws require this.

The price might be based on average cost in either firm if either is a

service center. Marginal cost pricing might be used as a measure of

incremental costs of output expansion.

When $Pm_2 = AR_1$ the profit-maximizing condition becomes (see

Appendix III.1) $MR_1 + rAR_1 - rM_2 {}^{dAR}1/dY_1 = MC_1 + rAR_1 = MC_2 = MR_2$. Figure

III.3 illustrates the effect of the tariff on intrafirm trade flows when

$Pm_2$ equals $AR_1$, the domestic selling price in the exporting country.

There are basically two tariff effects involved. The first we may call

the "ad valorem effects" because the shifts in the $MR_1$ and $MC_1$ curves

vary with the transfer price. Two processes occur simultaneously in the

ad valorem effects:

1) $MR_1$ shifts up by $rAR_1$. As $Y_1$ declines $AR_1$ rises and the new and old

$MR_1$ curves therefore intersect directly below where $AR_1$ cuts the $X_1$ axis.

2) $MC_1$ shifts up by $rAR_1$. In the no tariff situation the firm equates

$MR_1$ with $MC_1$ to determine maximum profits. Therefore to determine the

appropriate $AR_1$ for any level of $MC_1$ set $MC_1$ equal to $MR_1$ and pinpoint

the level of sales where $MR_1$ equals that level of $MC_1$. This sales level

determines $AR_1$. r percent of this level of $AR_1$ is then added to the

initial level of $MC_1$ to give a point on the new $MC_1 + rAR_1$ curve.

Since $MR_1$ and $MC_1$ curves intersect at $X_1 = Y_1$, and the curves both shift

up by $rAR_1$ the new intersection of $MR_1 + rAR_1$ with $MC_1 + rAR_1$ lies directly

above the old intersection. These two shifts therefore reduce exports by

raising the intersection of the MR and MC curves of firm 1 (assuming no

changes in firm 2's curves).

The second tariff effect we may call the "rotation effect"

because it causes the average revenue curve to rotate about the point

where no trade occurs. Due to the rotation effect $MR_1$ shifts up by

$-rM_2 dAR_1/dY_1$ since $dAR_1/dY_1 < 0$. Since $M_2$ equals $X_1 - Y_1$, $M_2$ can be

measured as the distance between the $MR_1$ and $MC_1$ curves at any level

where $MR_1 = MC_1$. At the initial intersection of the $MR_1$ and $MC_1$ curves

$M_2$ equals zero so the new MR curve rotates through the new intersection

point. Above the initial intersection $X_1$ exceeds $Y_1$ and so $MR_1$ rotates

Figure III.3

Profit Maximization With $Pm_2 = AR_1$ Under a Tariff Barrier
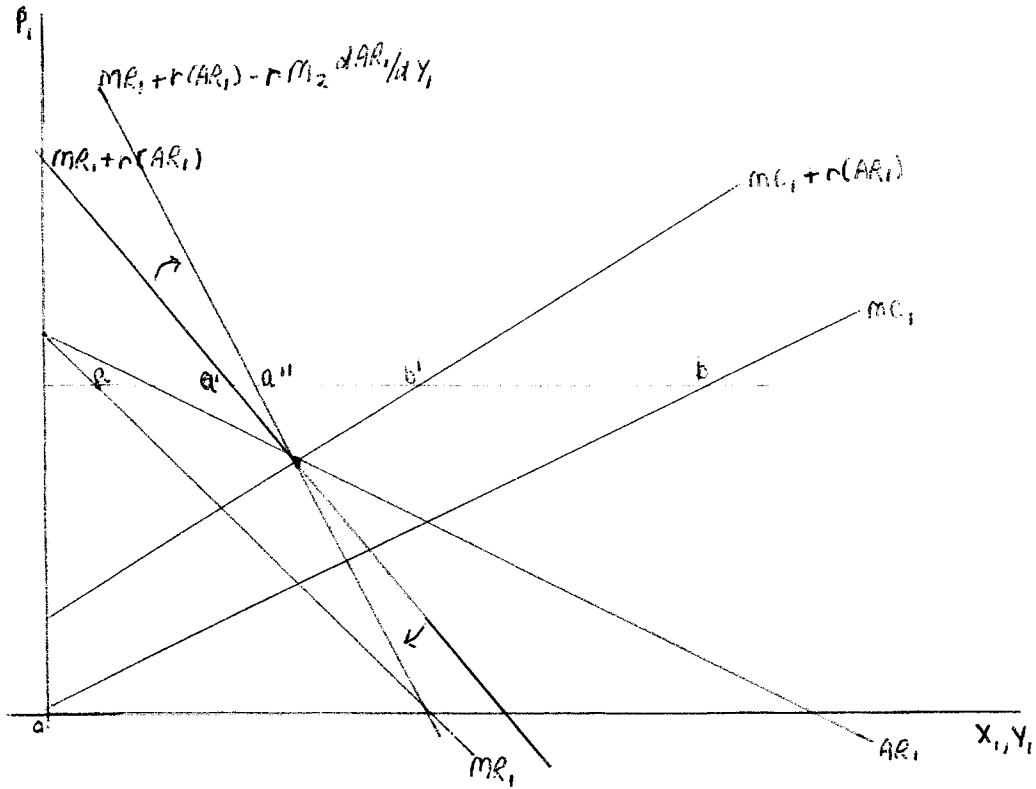


Figure III.4

Profit Maximization With $Pm_2 = AC_1$ Under a Tariff Barrier
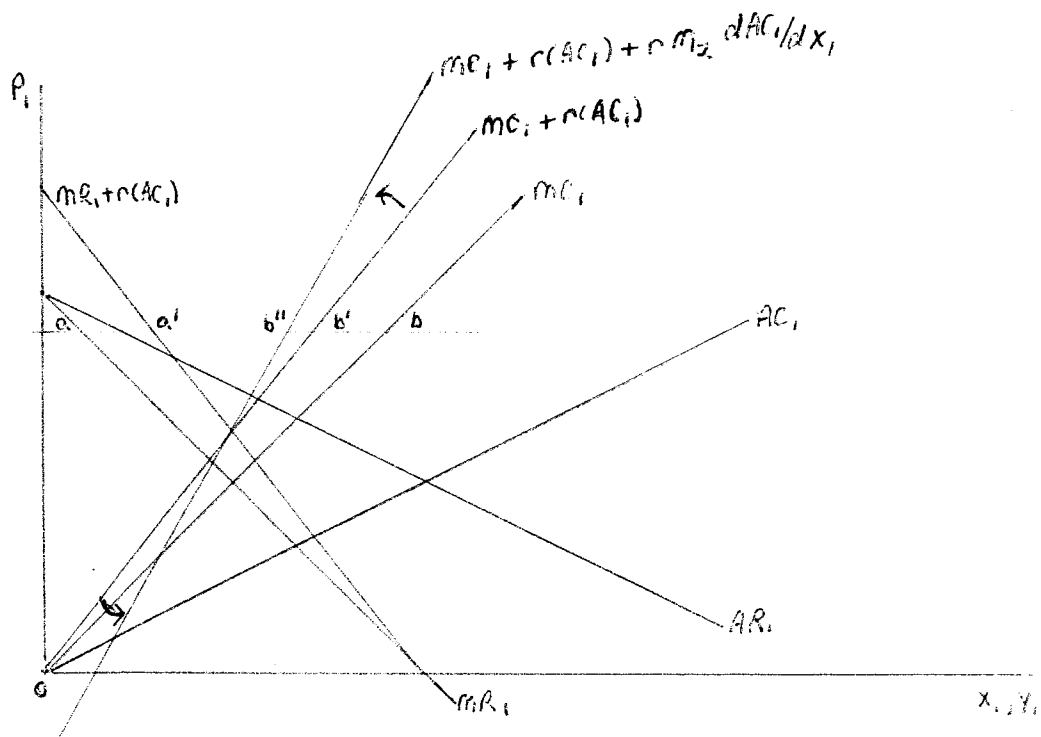
upwards. Below the initial intersection $Y_1$ exceeds $X_1$ and so $MR_1$ rotates downwards. That is, this third shift is a clockwise rotation of the $MR_1$ curve through the new intersection point.

Setting $Pm_2$ equal to $AR_1$ therefore has two effects:

1) It reduces exports by shifting the intersection of the new $MR_1$ and $MC_1$ curves vertically upward.

2) At any level where $MR_1$ equals $MC_1$ exports are reduced. For example before the tariff in Figure III.3 exports were $X_1 - Y_1$ or ab. Now they equal a''b' - a smaller amount.

The explanation of these effects is fairly straightforward. By raising the effective costs of units produced for trade, the tariff (as in the fixed transfer price situation) induces the firms to engage in less trade. In the particular case considered here, this general effect is compounded by the fact that reductions in trade actually reduce the effective per unit tariff payment. This is because as trade contracts, the transfer price is lowered i.e. the volume of trade and the trade price are positively related. There is, then, an unambiguous tendency for trade to contract. This result applies, in qualitative terms, to all cases in which the transfer price is positively related to the intrafirm trade volume. Transfer prices based on cost of the exporter, such as $AC_1$ or $MC_1$, also generate these results.

Figure III.4 illustrates the shifts in $MR_1$ and $MC_1$ when the transfer price equals $AC_1$ and the profit-maximizing condition is:
$MR_1 + rAC_1 = MC_1 + rAC_1 + rM_2{}^{dAC}1/dX_1 = MR_2 = MC_2$. Again there are two basic shifts:

1) The ad valorem effects cause $MC_1$ to shift up by $rAC_1$ (which is a counterclockwise rotation through the $MC_1$ curve where $AC_1$ equals zero)

and $MR_1$ to shift up by $rAC_1$. To determine the appropriate level of $AC_1$

for any $MR_1$ set $MR_1$ equal to $MC_1$ and note the volume of output where this

occurs. Then reading from the $AC_1$ curve at this output level determine

the value of $rAC_1$ and add this to the initial level of $MR_1$.

The new intersection of the $MR_1$ and $MC_1$ curves will lie directly above

the old intersection by the distance $rAC_1$. The tariff therefore reduces

exports by shifting the intersection of the $MR_1$ and $MC_1$ curves upward.

2) $MC_1$ rotates in a counterclockwise fashion through the new intersection

point. The third shift is $+rM_2 dAC_1/dX_1$ where $dAC_1/dX_1$ is positive, and

$M_2$ is positive where $X_1$ exceeds $Y_1$, zero where the $MR_1$ and $MC_1$ curves

intersect, and negative where $Y_1$ exceeds $X_1$. This rotation reduces

exports at any level.

Setting $Pm_2 = AC_1$ therefore has the same basic effects as

setting the transfer price equal to $AR_1$: the intersection is higher,

and at any level exports are reduced (in this case from ab to a'b''). 

Again the reason for these results is the positive relationship between

the export price and the volume of exports. Since the transfers occur

at average production cost no profits are declared in firm 1 on trade

and the price for tariff purposes is low. Therefore the ad valorem

export reducing effect is less than in the $AR_1$ case. Note in Figure III.4

the shift in the intersection of $MR_1$ and $MC_1$ is less in the $AC_1$ case.

($rAC_1$ compared to $rAR_1$)

With a transfer price equal to $MC_1$ the profit-maximizing condi-

tion is: $MR_1 + rMC_1 = MC_1 + rMC_1 + rM_2 dMC_1/dX_1 = MR_2 = MC_2$. When the

transfer price equals $MC_1$ both $MR_1$ and $MC_1$ shift up by $rMC_1$ and $MC_1$

rotates in a counterclockwise fashion. Therefore the intersection is

higher and exports are reduced at any level since the export price-volume relation-

ship is positive. Also the net shift upward is equal to $rMC_1$, which lies

between the shift $rAR_1$ in the first case and the shift $rAC_1$ in the second case. Transfer prices are somewhat higher when marginal cost pricing is used than when average cost pricing is used, and lower than when average revenue pricing is used.

A different set of circumstances applies when the transfer price is negatively related to trade volume, as it would be if it were equated to selling price in the importing country $(AR_2)$ or to costs in the importing country $(MC_2$ or $AC_2)$. The basic disincentive to trade due to the tariff persists. But if the transfer price declines as trade expands (and vice versa) there is a distinct incentive to at least minimize trade contraction. In some cases it may clearly be profitable to actually expand trade to take advantage of the lower effective per unit tariff payment. For example, if the transfer price is set equal to price in the importing country $(AR_2)$ the condition is: $MR_2 - rAR_2 + rM_1 dAR_2/dY_2 = MC_2 - rAR_2 = MR_1 = MC_1$. The marginal cost and revenue curves of firm 2 shift down by $rAR_2$ which is import reducing. However, $MR_2$ rotates in a counterclockwise fashion through the new intersection which tends to increase domestic sales (and therefore imports) at each level. The net effect on trade at any level where $MR_2$ equals $MC_2$ is therefore ambiguous. This is because setting $Pm_2 = AR_2$ implies a negative relationship between export price and export volume. If $M_2$ increases both $Pm_2$ and $P_2$ decrease as sales of $Y_2$ expand. This inverse relationship tends to increase imports by firm 2.

Similarly setting $Pm_2 = AC_1$ implies an inverse relationship and therefore, although the new intersection of $MR_2$ and $MC_2$ is lower and

discourages trade, at any level $MR_2 = MC_2$ there are opposing effects on imports. In some ranges the tariff may increase trade; in others, reduce trade.[22]

In summary, the choice of the transfer pricing system is crucial since it results in different directions of effects on trade and influences the magnitude of the trade change. When $AR_1$ pricing is followed the ad valorem shifts in $MR_1$ and $MC_1$ are the largest (compared to $AC_1$ or $MC_1$) and therefore the most trade reducing. The $AR_1$ rotation effect may be larger or smaller than the $AC_1$ or $MC_1$ effects because this depends on the slopes of the curves involved. Comparing $AR_2$ with $AC_2$ and $MC_2$ the ad valorem effects are again strongest with $AR_2$ while the size of the rotation effects depend on the slopes of the curves. When the export price--export volume relationship is negative the tariff can cause trade expansion, not contraction as predicted in the traditional tariff models. In the $AR_2$, $AC_2$ and $MC_2$ cases the supply of exports curve is actually negatively sloped and this can cause perverse results.

One can also note that in comparing the effects of a fixed versus a variable transfer price, if the prices were equal before the tariff was levied, ceteris paribus, variable transfer prices such as $AR_1$, $AC_1$ and $MC_1$ will be more trade contracting than their corresponding fixed prices, and prices such as $AR_2$, $AC_2$ and $MC_2$ less trade contracting.

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22.  The ad valorem revenue effect is $-rAR_2$ which must be compared with the rotation effect $+rM_1 dAR_2/dY_2$ to determine which is larger.

$$rAR_2 \gtreqless rM_1 dAR_2/dY_2$$

$$1 \gtreqless M_1/AR_2 \cdot dAR_2/dY_2$$

Since $dAR_2/dY_2 < 0$ and $M_1 < 0$ over the tariff range the net effect is ambiguous. In the $AC_2$ case comparing $-rAC_2$ with $+rM_2 dAC_2/dX_2$ yields a similar result (as does the $MC_2$ case.)

Support for these conclusions is given in an empirical study
of United States exports to Canadian subsidiaries in 1963 written by
Thomas Horst.[23] Horst's two significant findings are, first, that the
technological intensity of the U.S. parent is more closely related to
the sum of the parent's exports to Canada plus the domestic sales of its
Canadian subsidiaries than to either exports or domestic sales. This
supports the assumption of this dissertation that $M_2$ and $X_2$ are substitutes
for one another. They are alternative means of supplying $Y_2$ and the
choice between them will depend on real production costs and trade
barriers. Horst notes that this is a modified version of the comparative-
cost theory of international trade. His second major finding is that
Canadian tariff policy has affected the MNE's choice between exports and
subsidiary sales--the higher the tariff, the smaller the share of U.S.
exports in total sales in the Canadian market. That is, the tariff does
cause a reduction in trade flows. What is of interest from the viewpoint
of transfer pricing is that the relation between the tariff and the export
share is nonlinear. The fall in export share is much larger in response
to an increase in a low tariff than in response to an increase in a high
tariff. Horst hypothesizes that this could be caused by: 1) increasing
marginal production costs of the subsidiary, 2) transfer pricing of
imports at prices less than world prices, 3) the parent charging a high
transfer price when the tariff rate is low and a low price when the tariff
rate is high. This supports our view that multinationals can and do alter
transfer prices in response to tariff rates in such a way as to minimize
tariff costs.

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23.  T. Horst, "The Industrial Composition of U.S. Exports and Subsidiary
      Sales to the Canadian Market," The American Economic Review, 1972.

Factor Utilization Conditions

As shown in Appendix III.2 the tariff drives a wedge between $MR_1$ and $MR_2$. In the original, no-trade-barrier, situation the corporation equated $MR_1$ with $MR_2$. Now $MR_2$ is higher than $MR_1$ by the per unit tariff $rPm_2$ (assuming fixed transfer prices). Since $MR_1$ has declined compared to $MR_2$, the marginal productivity of labor and capital employed by firm 1 must have risen, and the productivity of labor and capital employed by firm 2 must have fallen since both firms face constant factor prices. That is, factors are released from firm 1 (output falls) and factors are hired by firm 2 (output expands).

If the supply of factors to the MNE is not perfectly elastic as factors are released from firm 1 their prices decline somewhat partially compensating for the full productivity rise in the perfectly competitive case. In firm 2 as output expands factor prices increase so that fewer additional factors are hired and therefore factor productivity does not fall as much. If the tariff results in a net expansion of total output and sales of the MNE the influence of the corporation in total factor employment in the two countries increases. If output and sales decline the MNE's influence on factor employment declines.

Since capital is perfectly mobile between the two countries the tariff does not affect the return to capital--$Pk_1$ still equals $Pk_2$ after the tariff. Under free trade the marginal productivity of capital was also equal in the two firms. However, the tariff raises the productivity of capital in firm 1 and lowers its productivity in firm 2 when the firms engage in trade. The new capital hiring condition becomes $rPm_2 = Pk(1/MPk_2 - 1/MPk_1)$. If the transfer price is zero or trade ceases the marginal capital productivities are equal. The higher the transfer price the more unequal the marginal productivities.

As Batra demonstrates, however, trade can only continue under the tariff if the goods moving across countries through repatriation of capital earnings are subject to the host country's tariff.[24] If the repatriated capital earnings are not affected by the tariff then international mobility of capital guarantees that the marginal productivity of capital must be everywhere the same. This can only be true if the tariff is zero and inoperative, that is, either trade must cease or the transfer price be zero. If the tariff does apply to capital movements goods mobility and capital mobility are not perfect substitutes. The tariff does cause increased capital movements but intrafirm goods trade also remains.

## The Gains from Trade

### Group Gains from Trade Under a Tariff

In Chapter II we discussed three gains from trade: producer, consumer, and factor gains. The tariff affects each of these gains, and also affects a fourth group that gains from intrafirm trade--the government levying the tariff. Let us examine each of these gains in turn.

The tariff barrier causes the producer gains from trade to unambiguously decline. This is illustrated in Figure III.5 assuming 1) fixed transfer prices,[25] 2) that the tariff does not cause any change in total output or sales of the MNE. Before the tariff the corporation produced where $MR_1 = MC_1 = MR_2 = MC_2$ at the level $a = b = a' = b'$. The tariff shifts $MR_1$ and $MC_1$ upward and the new curves are equalized at the

24. R. N. Batra, p. 325.
25. Using a fixed transfer price simplifies the analysis of the gains from trade. This can be modified to incorporate qualitative differences under variable transfer pricing such as the possibility of trade expansion in the $AR_2$, $AC_2$ and $MC_2$ cases.

level $c = d = c' = d'$.  Sales expand in firm 1 by $+\Delta Y_1$ and fall in firm 2 by $-\Delta Y_2$ where $+\Delta Y_1$ equals $-\Delta Y_2$ so that total sales are unchanged. Output rises in firm 2 and falls in firm 1 where $+\Delta X_2 = -\Delta X_1$ so total output is unchanged.  If pure profits of the corporation expand the producer gains from trade under the tariff.  That is, changes in total revenue and in total costs are the important factors in determining the producer trading gains.

There are two changes in total revenue.  Firm 2 loses revenue as sales decline.  This loss is measured by the area under $MR_2$ over the range $-\Delta Y_2$ or by $-ac\Delta Y_2$.  Firm 1 gains total revenue equal to $+a'e\Delta Y_1$. Since $-\Delta Y_2$ equals $+\Delta Y_1$ and $a = a'$ and $c = c'$ there is a net fall in total revenue of the triangle a'c'e to the MNE.

There are two changes in total cost.  Firm 2 produces more output at increased costs of $+bd\Delta X_2$.  Firm 1 produces less output so its costs fall by $-b'f\Delta X_1$.  Since $+\Delta X_2 = -\Delta X_1$ total costs increase by the triangle b'd'f.  That is, the redistribution of sales causes total revenue to decline and the redistribution of output causes total costs to increase.

There is a third decline in total profits caused by the redistribution of income to the government of country 2.  This is the tariff revenue paid by the MNE equal to the rectangle d'fec'.  So there are three losses in profits caused by the introduction of the tariff--the MNE unambiguously suffers losses.  The total loss, however, will be smaller than the tariff costs the MNE would have paid if no changes in output or sales allocations had been made  ( area a'ghb' ).

If the total volume of output expands in response to the tariff the fall in total revenue is somewhat smaller and rise in total cost

Figure III.5

Producer Gains from Trade Under a Tariff Barrier
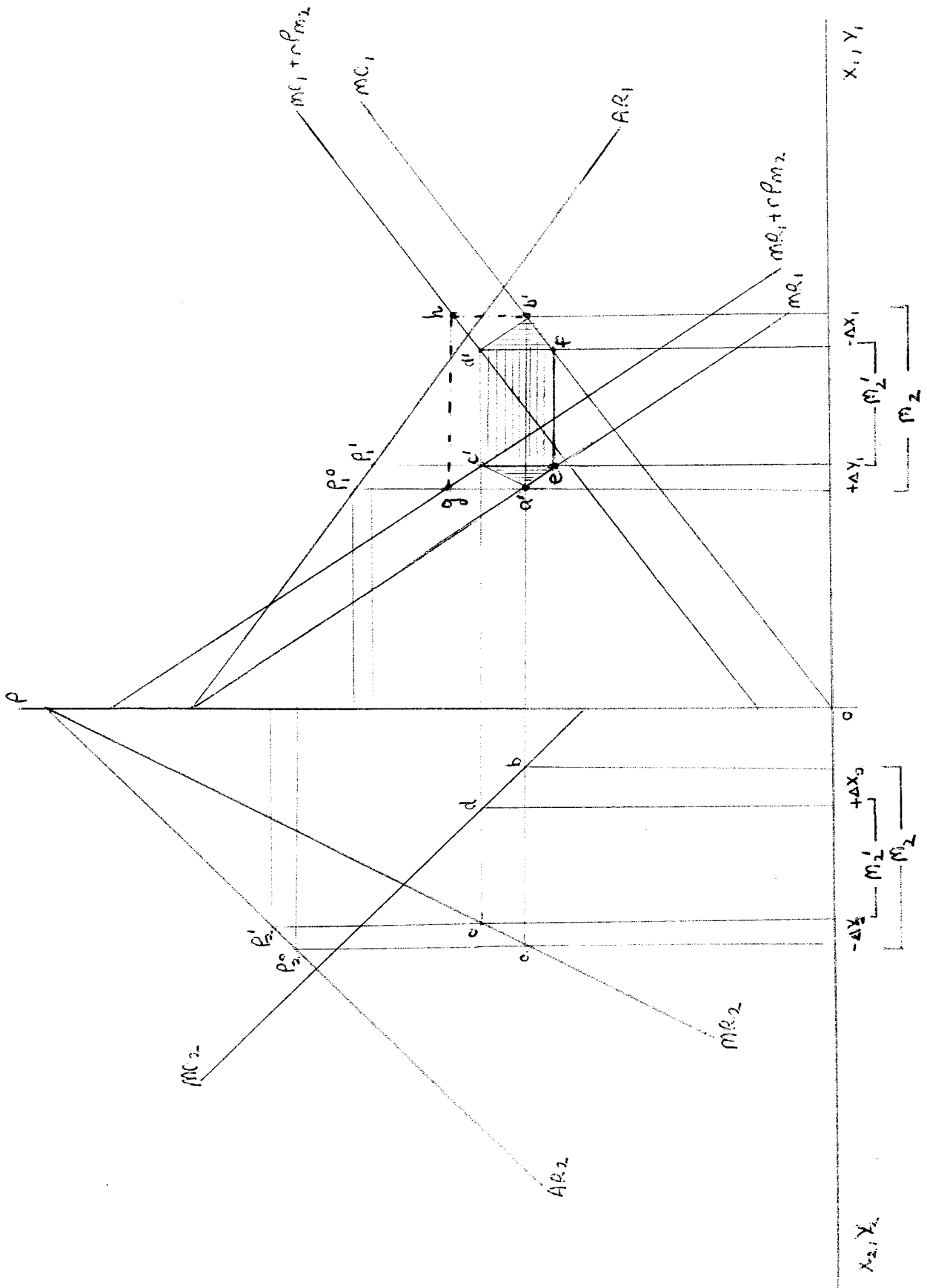
somewhat larger. If output and sales contract the fall in revenue is somewhat larger and the rise in costs somewhat smaller. However, producer gains still decline by more than the tariff revenue.

The second group affected by the tariff is the consumer group. Consumers in country 2 suffer a loss in consumer surplus of $\Delta P_2 Y_2 + 1/2 \Delta P_2 \Delta Y_2$. Consumers in country 1 gain surplus of $\Delta P_1 Y_1 + 1/2 \Delta P_1 \Delta Y_1$. Whether consumers as a group gain is ambiguous, depending on the demand elasticities, the initial sales and price levels and the changes in prices and sales.[26] Consumers are more likely to gain if total sales expand.

If factor markets are perfectly competitive factors as a group are unaffected by the tariff and reallocation of resources. If factor prices are affected, factor income changes will depend on 1) elasticity of factor supply, 2) elasticity of factor substitution, 3) net factor release from or hiring by the corporation.

The fourth group, government, unambiguously gains tariff revenue of $r P m_2 M_2$ if $P m_2$ exceeds zero and if trade does not cease. The government by levying the tariff captures part of the producer's gain from intrafirm trade and perhaps part of the consumers' gain.

## The Distribution of the Gains from Trade

The transfer price in the tariff case affects not only total trade gains but also the division of these gains between the firms and between countries.

The tariff causes domestic sales expansion in the 'low revenue market' (firm 1) by artificially raising the marginal revenue from domestic sales compared to exports. Consumers in the low revenue market

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26. See footnote 19 in Chapter II.

gain from the increased sales while consumers in the high revenue market lose. Within each country consumers who spend a larger share of their incomes on $Y_1$ gain in proportion to their purchases of $Y_1$ while consumers of $Y_2$ lose in proportion to their purchases of $Y_2$. The higher the per unit tariff (that is, the higher is the transfer price or the higher the tariff rate) the greater the distortion of output and sales and the smaller the trade volume given fixed transfer prices. The smaller the volume of trade the larger are the gains to firm 1's consumers and the larger the losses to consumers of $Y_2$.

If factor prices are unaffected by the reallocation of output there are no changes in total country-wide factor incomes. Within each country firm 1 now employs less factors and firm 2 more factors. The higher the transfer price the greater the wedge between $MR_1$ and $MR_2$ and the greater the discrepancy in the marginal productivity of factors between firms. If factor prices are affected by changes in output the factor used intensively in the expanding firm gains absolutely and relatively in income as a result of the tariff. In the contracting firm the intensive factor loses absolutely and relatively.

The government of country 2 gains tariff revenue of $rPm_2M_2$. If the corporation reduces trade volume (this fall depending on the size of $rPm_2$) tariff proceeds may be less than inititally expected by the government. Depending on supply and demand conditions a small change in the tariff rate may cause proceeds to rise or fall. This import elasticity would be affected by the ability of the MNE to adjust the transfer price in response to a change in the tariff rate. A rise in the tariff rate may cause proceeds to decline because either volume falls

or the transfer price falls. The more vigilant the tariff authorities
the less likely is the MNE to vary the transfer price inversely with
the tariff rate.

The tariff also affects the division of producer's gains.
Before the tariff, firm 1's profits were $Y_1(P_1 - AC_1) + M_2(Pm_2 - AC_1)$.
The tariff causes $Y_1$ to rise and $M_2$ to decline. As $Y_1$ rises $P_1$ falls, and
as $X_1$ falls, $AC_1$ falls. If the average cost function is linear the fall
in $P_1$ is exactly matched by an equivalent fall in $AC_1$. (See Appendix
III.4.) The change in profits between the tariff and no tariff posi-
tions can be written as $\Delta Y_1(\Delta P_1 - \Delta AC_1) + \Delta M_2(Pm_2 - \Delta AC_1)$. Profits on
$Y_1$ therefore increase as $Y_1$ increases if the cost function is linear.
If $AC_1$ is an increasing function of $X_1$ the fall in $AC_1$ exceeds the fall
in $P_1$ and profits on $Y_1$ are larger than otherwise. Since the transfer
price is unaffected by changes in trade volume and $AC_1$ declines per unit
export profits increase. However, the volume of exports will probably
decline. Profits on $M_2$ may therefore rise or fall depending on whether
the per unit gain is offset by the fall in volume. The higher the initial
transfer price the higher the tariff and thus the more likely the fall in
volume, ceteris paribus, and the more likely a decline in export profits.
Also the larger the initial trade volume the more likely is a substantial
fall in exports and therefore in profits. Total profits of firm 1 may
rise or fall since profits on $Y_1$ increase while the change in profits on
$M_2$ is uncertain. The larger the share of $M_2$ in $X_1$ the more likely are
firm 1's profits to decline.

Firm 2's profits in the no trade barriers situation were $X_2(P_2 - AC_2) + M_2(P_2 - Pm_2)$. The tariff causes $X_2$ to rise (raising $AC_2$) and $M_2$
to fall ($P_2$ rises as $Y_2$ declines). If the average cost function is linear

the rise in $P_2$ is matched by an equal rise in $AC_2$. The change in profits

between the two situations can be written as $\Delta X_2(\Delta P_2 - \Delta AC_2) + \Delta M_2(\Delta P_2 -$

$Pm_2) - M_2^1 rPm_2$. Profits on $X_2$ therefore increase if the cost function is

linear. If $AC_2$ rises as $X_2$ increases per unit profits on $X_2$ decline. If

imports decline $P_2$ increases, so that the change in $P_2 M_2$ is ambiguous.

Firm 2's profits unambiguously fall by the tariff on imports. The larger

the volume of trade after the tariff and the higher the transfer price

the more likely is a decline in firm 2's profits in addition to tariff costs.

Therefore, while we can unambiguously declare that total

corporate profits decline and actually decline by more than the tariff,

we are unable to determine the division of profits between the two firms.

This point is also made by Batra who notes that "a change in the relative

commodity prices exerts a determinate influence on the real incomes of

the primary factors but not on those of the monopolists. The same is

true of the relative returns of the monopolists...the final result is

indeterminate."[27] This is because as the relative prices change 1) out-

put is reallocated between the two firms and 2) the demand elasticities

change. As $P_2$ rises, $X_2$ rises and $E_2$, the price elasticity of demand

increases. As $P_1$ falls $X_1$ and $E_1$ decline. The formula for the relative

returns to the monopolists as given by Batra is:

$$\frac{TT_2}{TT_1} = \frac{P_2}{P_1} \cdot \frac{X_2}{X_1} \cdot \frac{E_1}{E_2} \quad {}^{28}$$

which is indeterminate.

27. R. N. Batra, page 296.
28. R. N. Batra, page 296.

Effects of the Tariff on

National Income and the Balance of Payments

The gains from trade under a tariff may be viewed in another light as contributions to the domestic and national incomes of countries 1 and 2.

The change in firm 1's contribution to country 1's domestic income is $\Delta P_1 \Delta Y_1 + Pm_2 \Delta M_2$. Revenue from domestic sales increases while revenue from exports declines, the net effect depending on the share of exports in total production. As output falls, less factors are hired so employment earnings generated in firm 1 decline. Pure profits rise or fall again depending on the ratio of $M_2$ to $X_1$.

The change in firm 2's contribution to country 2's domestic income is $\Delta P_2 \Delta Y_2 - Pm_2 \Delta M_2 + rPm_2 M_2'$. Revenue from sales declines while import costs fall. Tariff revenue of $rPm_2 M_2$ is paid to the government. Firm 2's contribution may actually increase although its profits decline. The firm's share in factor employment income rises.

National income includes income of residents earned within the country and remitted from abroad. Country 1's national income is affected by: 1) changes in factor prices, 2) changes in national profits. If factor prices fall as output of $X_1$ declines national income declines. Also since total corporate profits fall by more than the tariff, country 1's national income may be expected to fall since repatriated profits will be less, depending on the per unit tariff costs. National income of country 2 is affected by 1) changes in factor prices, 2) the amount of unrepatriated profits, 3) the tariff revenue, 4) whether there is any net inflow of capital from country 1 in response to output and price changes. If output increases cause factor prices to rise national income

rises. If there are more factor inflows, national income is reduced by the increased outflow of factor earnings. The amount of unrepatriated profits will depend on total profits of firm 2 after the tariff and any changes in the rate of repatriation. The tariff revenue is an unambiguous increase in the government's income.

The Balance of Payments between the two countries will be affected by 1) factor flows, 2) profit flows, 3) intrafirm trade flows. The volume and value of intrafirm trade may be expected to decline as the MNE attempts to avoid the tariff by lowering the transfer price and/or reducing the volume of trade. There may be increased factor flows in response to output and factor price changes, the direction of movement probably from country 1 to country 2. The profits flow from firm 2 will be reduced by more or less than the tariff revenue depending on whether the rate of repatriation is increased or not. In general country 1 can expect reduced earnings on intrafirm trade and profit flows and possibly increased earnings on factor flows. The tariff, as expected, harms the exporting country, that harm depending on the fall in trade and profits.

## Conclusions

The transfer price has a role to play in affecting total gains from trade in addition to the distribution of these gains. Joint profit maximization under a fixed transfer price results in usually less trade and a reallocation of output and sales between the two firms, the size of these changes depending on $rPm_2$. The corporation would prefer to set a minimal transfer price since this minimizes tariff costs and also minimizes the distortion of resources. The MNE suffers a loss in profits in excess of the tariff costs because of this distortion. Consumers as a

group may gain or lose from the tariff. Consumers in the exporting country gain while those in the importing country suffer. If factor markets are perfectly competitive, factor incomes are unchanged by the tariff although factor allocation between firms is changed. If factor prices do change, factors in the importing country benefit while factors in the exporting country suffer. The government gains tariff revenue through capturing part of the MNE's profits. The Balance of Payments of country 1, the exporter, worsens. Under variable transfer prices there is either a positive or negative relationship between export price and the volume of exports. The tariff is export reducing in the $AR_1$, $AC_1$ and $MC_1$ cases since the $Pm_2 - M_2$ relationship is positive. But trade volume may actually increase if transfer prices based on $AR_2$, $AC_2$ or $MC_2$ are used. The ad valorem effects are uniformly trade reducing but the rotation effect may be either trade creating or trade contracting.

Chapter IV

THE MULTINATIONAL ENTERPRISE AND TAXATION BY THE HOME COUNTRY

## Introduction

Tax Policy and the Multinational Enterprise

The multinational corporation under free trade will determine
its output, sales and pricing policies on the basis of internal efficiency
calculations so as to maximize global profits.  Its transfer pricing
policy will determine the allocation of this profit among divisions of
the MNE.  It is entirely possible that this policy may allocate all of
the trade gains to one country.  For example, where the parent firm
views foreign countries as risky environments, the tendency will be
to shift profits to the home country.  Host countries, as a result, suffer
not only reduced retained earnings but also reduced stocks of foreign
exchange, lower export prices or higher import prices.  High inflation
rates or foreign exchange fluctuations may cause a multinational to
shift profits out of a country, either home or host.  Since governments
do not want to leave the distribution of the benefits from foreign
investment and intrafirm trade in the hands of the MNE's, many governments
now use tax policy as a method of increasing their country's benefits
from foreign investment and trade.

Jack Behrman lists five objectives of tax policy with respect
to multinationals.[1]  Tax policy should :

1) maximize the government's share of the revenues without reducing
the total revenues of the MNE

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1.  J. N. Behrman, "Taxation of Extractive Industries in Latin America
and the Impact on Foreign Investors" in R. F. Mikesell et al., Foreign
Investment in the Petroleum and Mineral Industries, 1971, p. 67.

2) influence the level and pattern of resource development and exploi-

tation in line with government policy

3) encourage backward and forward industry linkages

4) influence export prices

5) achieve national objectives.

From the point of view of the host country tax policy should

promote foreign investment, maximize the profits from this investment and

capture all MNE profits through taxation. These objectives often cannot

be satisfied simultaneously and some, as we shall see later, such as the

first may be attainable only under special conditions. Governments will

attach different weights to these objectives as economic conditions,

pressure groups and the influence of the multinationals change. (In the

United States the emphasis on maximizing the government's revenue appears

to dominate all other objectives. This emphasis on the first objective

seems stronger than in any other country.)[2]

From the point of view of the multinational, tax policy has

a strong effect on corporate decisions. In a 1967 study of dividend

remittance practices of U.S. corporations 25 percent of the corporations

said tax policy was the most important factor in their policy decisions

while 40-50 percent paid considerable attention to taxes.[3] A study of

130 companies in 1970 stated that "Tax and customs considerations and

the desires of domestic divisional executives and local managers abroad

have a profound influence on corporate policy."[4] Where tax rates differ

between countries the multinational has an incentive to shift its profits

2. R. Hays, C. Korth and M. Roudiani, International Business, 1972, page 380.
3. M. Brooke and H. L. Remmers, The Strategy of Multinational Enterprise: Organization and Finance, 1970, page 163.
4. J. Greene and M. Duerr, Intercompany Transactions in the Multinational Firm: A Survey, The Conference Board, 1970, p. iv.

to the lowest taxed country in order to minimize its tax costs and therefore maximize its after-tax profits. Transfer pricing can shift profits to the low tax jurisdiction by artificially raising the export prices and lowering the import prices of the low taxed firm. Foreign base companies can be set up in low tax countries (tax havens) and, through transfer pricing, profits shifted to these companies. Where the home government taxes subsidiary dividends only when they are remitted to the parent firm, taxes can be deferred by a low remittance rate. Since tax deferral is equivalent to tax reduction[5] manipulating dividend remittance rates is a partial substitute for manipulating transfer prices. This point is also made by Brooke and Remmers, who note: "royalties, fees, interest and trade--should be properly considered a remittance of earnings, for, in principle, they constitute payment for specific services or goods received by the subsidiary."[6] A rational multinational will therefore attempt to minimize its tax costs by altering transfer prices, deferring dividends, changing its distribution of payments, and utilizing special organizational structures such as foreign base companies.

The desires of governments to maximize their revenues and the desires of multinationals to minimize tax payments create an inevitable conflict. This conflict has been outlined in a brief model by Hymer.[7] Hymer notes that the government provides support services to the MNE in return for taxes and royalty payments. This is a trading relationship based on two variables, the tax rate (t) and the fraction of government expenditure devoted to servicing the MNE (g). The goal of the government

5.  C. S. Shoup, Public Finance, 1969, pages 323 and 636.
6.  M. Brooke and H. L. Remmers, page 161.
7.  S. H. Hymer, "The Efficiency (Contradictions) of Multinational Corporations," in G. Paquet, editor, The Multinational Firm and the Nation State, 1972, pp. 60-61.

is to maximize the surplus of tax revenues over support costs. The goal of the corporation is to maximize after tax profits. In this bilateral bargaining relationship if the government is all-powerful, it will choose values for "g" and "t" such that after tax MNE profits are zero. If the MNE is omnipotent it will set "t" as low as possible without either causing the government to fall or lowering the level of support services. The precise values of "g" and "t" will depend on the bargaining strengths of the two parties. As Mikesell emphasizes bargaining power fluctuates with the size of profits, the volume of investment, the possibility of shifting production elsewhere, the growth of the industry, the presence of minority shareholders, the strength of nationalistic feeling in the population, and other environmental factors.[8]

Governments have reacted to the tax avoidance practices of the multinationals by passing laws to eliminate the loopholes in their tax legislation. For example, prior to 1962, the United States Treasury taxed only remitted profits of foreign subsidiaries. Many corporations established foreign base holding companies in countries with low tax rates that did not impose taxes on remitted profits. By using these companies as conduits for channelling funds between affiliates tax payments to the U.S. were minimized. The 1962 legislation removed this loophole by making the U.S. parent liable for taxation on the Sub Part F income of these holding companies as earned rather than as repatriated.[9] Many home governments encourage high repatriation rates (the U.S., the U.K.) in order to increase tax revenues and improve their Balance of

8.  R. Mikesell, "Conflict in Foreign Investor--Host Country Relations: A Preliminary Analysis" in Mikesell et al., Foreign Investment, pp. 29-55.
9.  D. P. Rutenberg, "Maneuvering Liquid Assets in a Multinational Company," Management Science Applications, June 1970, pages 671-2.

Payments.  Both the Canadian and U.S. governments stipulate that arm's

length transfer prices will apply for purposes of income taxation.  The

fair market value standard is followed by most MNE's, according to

Greene and Duerr, in order to satisfy the U.S. Treasury.  They note that

the usefulness of declaring profits in low tax jurisdictions is diminishing

while the hazards of double taxation are increasing.[10]  Brooke and Remmers

claim, that in order for transfer price manipulation to be profitable,

large tax differentials, adequate profit margins, and low customs duties

are necessary.  The main tax advantage is tax deferral, not tax reduction.[11]

The OPEC countries have attempted to control export prices and increase

their tax revenues through posted prices.  This also restricts transfer

price adjustments.[12]

In summary, the objectives of the multinational corporation and

the nation state are certain to conflict.  Governments attempt to maximize

their revenues; corporations attempt to minimize taxes.  The resolution

of the conflict will depend on the bargaining strengths of the parties

involved.  Actual tax practice has been to legislate controlling tax

avoidance measures such as transfer pricing, tax havens, and low remittance

rates.  Tax policies as a result of their ad hoc nature, may or may not

reflect generally accepted principles with respect to resource allocation.

10.  J. Greene and M. Duerr, pp. iv, 48.
11.  M. Brooke and H. L. Remmers, page 176.
12.  E. Penrose, The Large International Firm, pp. 69, 71.

International Taxation--Efficiency Requirements

From a global viewpoint there are two requirements for efficient resource allocation:[13]

1) Tax policies should not affect the choice of country in which factors are employed.

2) Tax policies should not affect international commodity flows.

That is, tax policies should not affect international goods or factor flows and thus not affect relative commodity or factor prices. A tax on the pure profits of a monopolist is often held to be neutral, in that the total tax incidence falls on the monopolist and is not passed on to consumers or factors. Penrose notes that "the economists of OPEC are fully aware of the general principle that a tax that falls strictly on rents will not reduce output."[14] However, we shall see that only under very restrictive conditions is a profits tax truly neutral. In general taxes on pure MNE profits will distort resource decisions. Musgrave notes that corporate income taxes are nonneutral because of tax deferrals, tax exemptions and tax differentials between countries. For true neutrality all income should be taxed at the same rate as earned regardless of the form of business organization.[15]

Tax deferrals occur when the taxing authority permits postponement of the tax. Most home countries permit deferment of taxes on foreign subsidiary income until the affiliate profits are repatriated.

13. R. A. Musgrave and P. B. Richman, "Allocation Aspects, Domestic and International" in N.B.E.R.--Brookings, The Role of Direct and Indirect Taxes in the Federal Revenue System, J. Due, editor, 1962, p. 102.
14. E. T. Penrose, The Large International Firm, page 256.
15. P. B. Musgrave, "International Tax Differentials for Multinational Corporations: Equity and Efficiency Considerations" in U.N. The Impact of Multinational Corporations, p. 45.

Therefore the parent firm faces a higher tax rate than the subsidiary whenever the rate of repatriation is less than 100 percent (assuming there are no foreign taxes). This tax differential induces the MNE to shift profits to the foreign subsidiary.

Tax exemptions are given by governments to certain classes of income. Some governments (France, Canada until 1975) completely exempt foreign dividends from taxation whether remitted or not. This also provides an incentive to shift profits to the foreign subsidiary.

Tax differentials depend not only on stated tax rates, but also on the availability of tax deferral and tax exemption. Tax differentials exist between countries and between forms of business organization. Many countries tax foreign branch income at full rates as earned but only tax subsidiary income when remitted. This introduces an additional nonneutral factor in the treatment of the foreign income.

Since most governments determine their tax policies on the basis of maximizing tax revenues and achieving national objectives it is not surprising that global criteria for tax neutrality are not met. When tax differentials, deferments and exemptions exist, there is scope for the multinational enterprise to minimize its tax obligations. This can cause inequity among tax payers since investors do not pay the same tax wherever they invest. In general, the tax differential will cause distortions in the MNE's resource allocation decisions resulting in lower pretax profits and less efficient production. Where the tax can be shifted to consumers or factors, output, sales and prices will change in response to the tax. This chapter outlines the responses a profit-maximizing MNE would make to taxation of its pure profits and the resulting disturbances to resource allocation.

## Profit Maximization Under a Pure Profits Tax

### Assumptions of the Model

The MNE is a multiplant multimarket monopolist consisting of
two horizontally integrated firms producing identical final products for
sale in their domestic markets. Price discrimination between these markets
is possible. The firms engage in trade, intrafirm exports flowing from
the 'low cost--low revenue' firm to the 'high cost--high revenue' firm.

Country 1 levies a tax on corporate profits. Since the MNE
is assumed to rent its capital from capital owners this tax does not
fall directly on capital. The MNE can deduct interest as a business
expense and therefore the corporate tax applies only to pure profits of
the corporation. That is, the tax applies to the return to the scarce
factor, technology or entrepreneurial capacity, assumed wholly owned by
the MNE.

The government of country 1 is entitled to tax the income of
all domestic corporations including firm 1 since firm 1 is resident and
earns income in country 1. But does the government have the right to tax
the foreign income of domestic firms, specifically, the profits of firm 2?
Current taxation of foreign income is based on two principles: source
and residence. Under the source rule all corporate income is taxed where
it originates if the business is incorporated in the country or is a
permanent establishment (branch). Under this principle government 1 is
not entitled to tax the profits of firm 2 since its income is earned
outside the borders of country 1. Under the residence principle, global
income is taxable according to place of incorporation (as in the U.S.,
Canada, and the U.K.) or seat of management (France, Belgium, Greece).
If firm 2 is a branch of the MNE, its place of residence is country 1 and

the seat of management is also in country 1 since this is the location

of the parent. Therefore all of firm 2's profits are taxable as earned

by government 1 if firm 2 is a branch. However, if firm 2 is a subsidiary

incorporated in country 2, common practice under the residence principle

is that country 1 does not tax firm 2's income until it is repatriated by

dividend payments from firm 2 to firm 1. This is the principle of tax

deferral. These principles were established in the OECD Model Tax Treaty

on Income and Capital in 1963.[16] In general the source country has the

primary right to tax.

This chapter restricts itself to taxation by one government

only, specifically to taxation by the home country. If government 1

follows the source principle, only firm 1's profits are taxable. If the

residence rule is applied and firm 2 is a branch, total profits of the MNE

are taxed as they are earned. If firm 2 is a subsidiary under the residence

rule, only remitted foreign profits are taxable. Let 'b' therefore stand

for the fraction of firm 2's profits that are legally taxable by government

1 (which may or may not equal the fraction actually remitted by firm 2).

Where b is zero the source rule applies; where b equals one the residence-

branch rule is used; and where $0 < b < 1$ the residence-subsidiary rule is

followed. The residence-subsidiary rule assumes that firm 2 must repat-

riate some profits each year for the benefit of home shareholders but

that full repatriation in any one year does not occur because some profits

are used for reinvestment in the firm. Obviously if the subsidiary remits

all of its profits the form of organization does not affect the total tax

bill under these assumptions.

16. Draft Double Taxation Convention on Income and Capital, Report of
the OECD Fiscal Committee, 1963.

This chapter ignores taxation by the host government. The host country under both residence and source rule is entitled to tax only the income of firm 2; hence in the present case, foreign taxation of income does not arise. By selecting country 1 as the tax levying country the effects of taxation of $TT_1$ and of $TT_2$ can be studied. Also since taxation by government 2 is exactly the reverse situation to taxation by government 1 where b equals zero the results in this chapter can be reinterpreted as causing exactly the opposite results when country 2 levies a tax on firm 2's profits. Therefore there is no need to deal specifically with host country taxation, as long as only one of the countries imposes the tax.

## Profit Maximizing Conditions Under a Pure Profits Tax

### Firm 1 is Initially the Exporter

As shown in Appendix IV.1 the general condition for joint profit maximization with a profits tax where firm 1 is initially the exporter is:

$$\frac{1-t}{1-bt}MR_1 + \frac{t-bt}{1-bt}Pm_2 - \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dY_1} + \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dY_2} =$$

$$\frac{1-t}{1-bt}MC_1 + \frac{t-bt}{1-bt}Pm_2 + \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dX_1} - \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dX_2} = MR_2 = MC_2$$

The MNE equates $MR_2$ and $MC_2$ to after-tax $MR_1$ and $MC_1$ adjusted for the effects of the transfer price, $Pm_2$, where 't' is the tax rate on profits and 'b' is the fraction of firm 2's profits legally taxable in country 1.

Joint profit maximization is therefore affected by the transfer price. The following subsections examine the effects on firm 1 of several possible transfer prices.

A Fixed Transfer Price

Where the transfer price is unaffected by output or sales changes in either country the equilibrium condition reduces to:

$$\frac{1-t}{1-bt}MR_1 + \frac{t-bt}{1-bt}Pm_2 = \frac{1-t}{1-bt}MC_1 + \frac{t-bt}{1-bt}Pm_2 = MR_2 = MC_2$$

The tax has 2 basic effects on firm 1:

1) It acts as an ad valorem tax on domestic sales, $Y_1$, by shifting $MR_1$ down by $(t-bt)/(1-bt)$ percent ie. to $(1-t)/(1-bt)MR_1$. The $MR_1$ curve rotates counterclockwise, its intercept with the X axis being the pivot. This tends to reduce domestic sales for any output level and therefore to increase exports.

It acts as an ad valorem subsidy of $t-bt/1-bt$ % (the same rate) to domestic output of $X_1$ by shifting down $MC_1$ to $(1-t)/(1-bt)MC_1$. For any level of sales this is export increasing. The ad valorem effects are therefore trade expanding.

2) The tax increases $MR_1$ at each domestic sales level $(Y_1)$ by a fixed amount $(t-bt/1-bt)Pm_2$. This specific subsidy to $Y_1$ causes exports to decline for any given level of production, $X_1$.

For any given level of domestic sales, $Y_1$, the tax increases $MC_1$ by the fixed amount $(t-bt/1-bt)Pm_2$. This specific tax on $X_1$ acts to reduce domestic production and discourage exports for any level of domestic sales.

The specific effects are therefore trade contracting.

The final effect of the profits tax may be either trade expanding or contracting. If initially the firms were not engaged in trade, then under the tax the MNE would equate the after tax $MR_1$ and $MC_1$ to the after tax $MR_2$ and $MC_2$ only. That is, the marginal revenue and cost curves of firm 1 would shift down by t percent, and the marginal cost and revenue curves of firm 2 by bt percent. Unless $b = 1$, t must exceed bt and the new intersection of $MR_1$ and $MC_1$ after tax must lie below the intersection of $MR_2$ and $MC_2$ after tax. That is, firm 1 becomes the low cost--low revenue firm and intrafirm trade becomes profitable. In this instance the direct tax effects on marginal revenue and marginal cost are thus trade expanding.

When the firms engage in trade the transfer price enters as a relevant variable. The higher the transfer price the larger the share of trade profits declared by the exporting firm, and the smaller the share by the importer. Since firm 1's profits are taxed more highly than firm 2's a low transfer price minimizes tax paid on intrafirm trade. In order to maximize profits the MNE attempts to set as low a price on exports from firm 1 as possible. The higher the transfer price the greater the subsidy to domestic sales of $Y_1$ compared to export sales, and the greater the tax on domestic production for export. Since the transfer price is unaffected by changes in output or sales the transfer price effects are similar to a specific subsidy to $Y_1$ and a specific tax on $X_1$ which both discourage trade.

Figure IV.1 illustrates the effects of the profits tax on firm 1. Initially the firm exports ab to firm 2. Then the tax is imposed. The ad valorem effects 1) cause $MR_1$ to shift downwards to

$(1 - t/1 - bt)MR_1$ (rotating counterclockwise about $Y_1$ axis intercept)

causing domestic sales to decline to a', and 2) cause $MC_1$ to shift down

to $(1 - t/1 - bt)MC_1$ expanding domestic production to b'. The ad valorem

effects expand trade from ab to a'b'. The specific effects shift the

new $MR_1$ and $MC_1$ after tax curves up at each level by $(t - bt/1 - bt)Pm_2$,

causing domestic sales to rise from a' to a'' and production to fall from

b' to b''. The net exports after tax are a''b'' which may be larger

or smaller than intrafirm pretax trade.

If the final $MC_1$ curve cuts the original $MC_1$ curve below b

(the $MC_1$ level under free trade) production is larger than before the

tax; if it cuts it at b production is unchanged; and if the curves inter-

sect above b production is smaller. That is, the larger the specific

tax effect the more likely is a decline in production. If the final

$MR_1$ curve cuts the original $MR_1$ curve below a (the $MR_1$ level under free

trade) sales expand; at a, there is no change; above a, sales decline.

In summary, if the transfer price causes the final and original curves

to intersect below the free trade level ab, trade expands; at that level,

trade is unchanged; above that level, trade contracts. In terms of the

possible transfer prices that could be set by the MNE, if the corporation

chooses a transfer price fixed at the level of $MC_1$ under free trade

(that is, where the condition $MR_1 = MC_1 = MR_2 = MC_2$ is satisfied) the

ad valorem effects expanding trade and the specific effects contracting

trade cancel. The net effect is no change in trade flows in response

to the tax. We can therefore designate this as an 'equilibrium' fixed

$Pm_2$. A transfer price greater than $MC_1$ under free trade will cause the

specific effects to outweigh the ad valorem effects so that trade contracts.

We may call this $Pm_2$ a 'high' transfer price. Finally, under a 'low'

transfer price the ad valorem effects will dominate and trade will expand.

Figure IV.1

Tax Effects on Firm 1 Under a Fixed Transfer Price



$$\tfrac{1-t}{1-bt}\,mc_i + \tfrac{t-bt}{1-bt}\,P_{m_2}$$

$$\tfrac{1-t}{1-bt}\,mc_i$$

$$\tfrac{1-t}{1-bt}\,mR_i + \tfrac{t-bt}{1-bt}\,P_{m_2}$$

$$\tfrac{1-t}{1-bt}\,mR_i$$
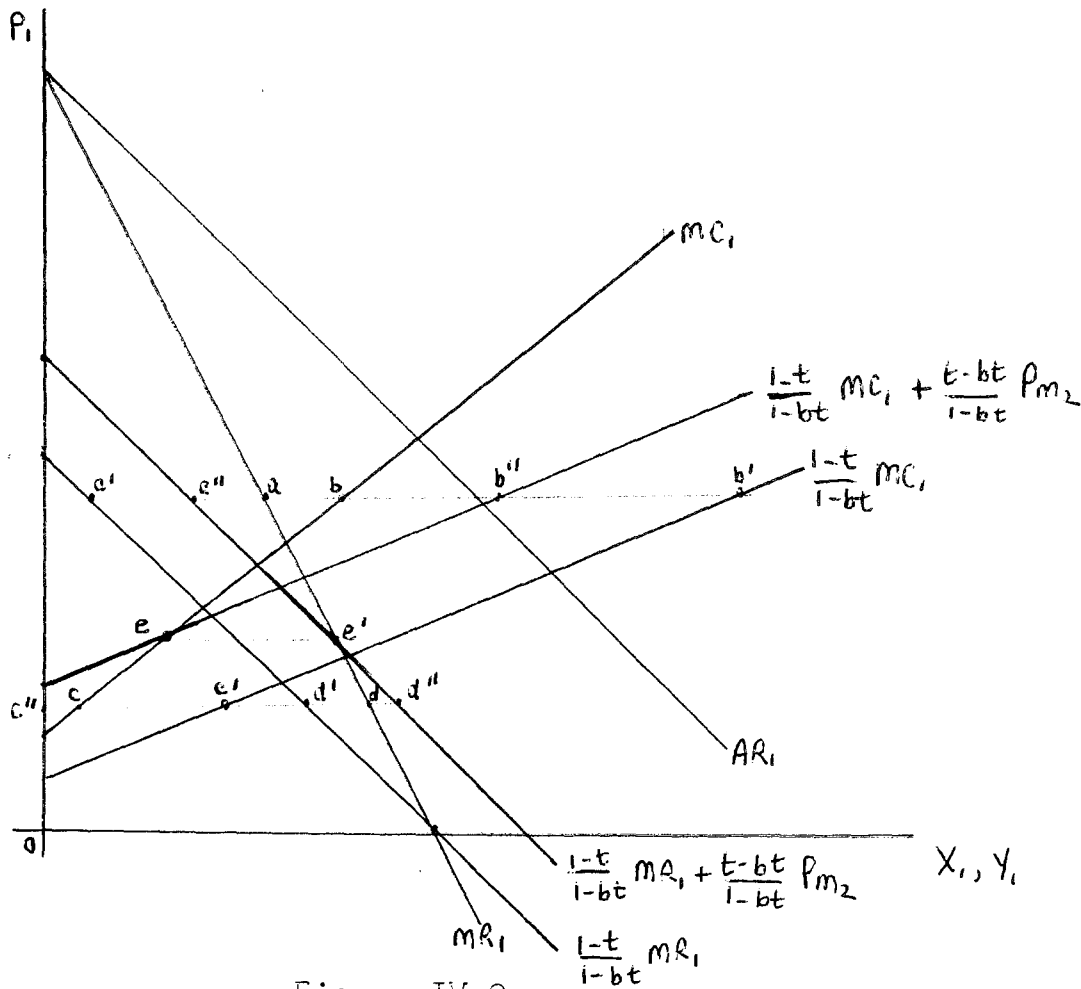
Figure IV.2

Tax Effects on Firm 1 Where $P_{m_2}$ Equals $AR_1$



$$mR_i + \tfrac{t-bt}{1-bt}(AR_i - mR_i) - \tfrac{t-bt}{1-bt} M_2 \tfrac{dAR_i}{dY_i}$$

$$mc_i + \tfrac{t-bt}{1-bt}(AR_i - mc_i)$$

$$mR_i \qquad mR_i + \tfrac{t-bt}{1-bt}(AR_i - mR_i)$$
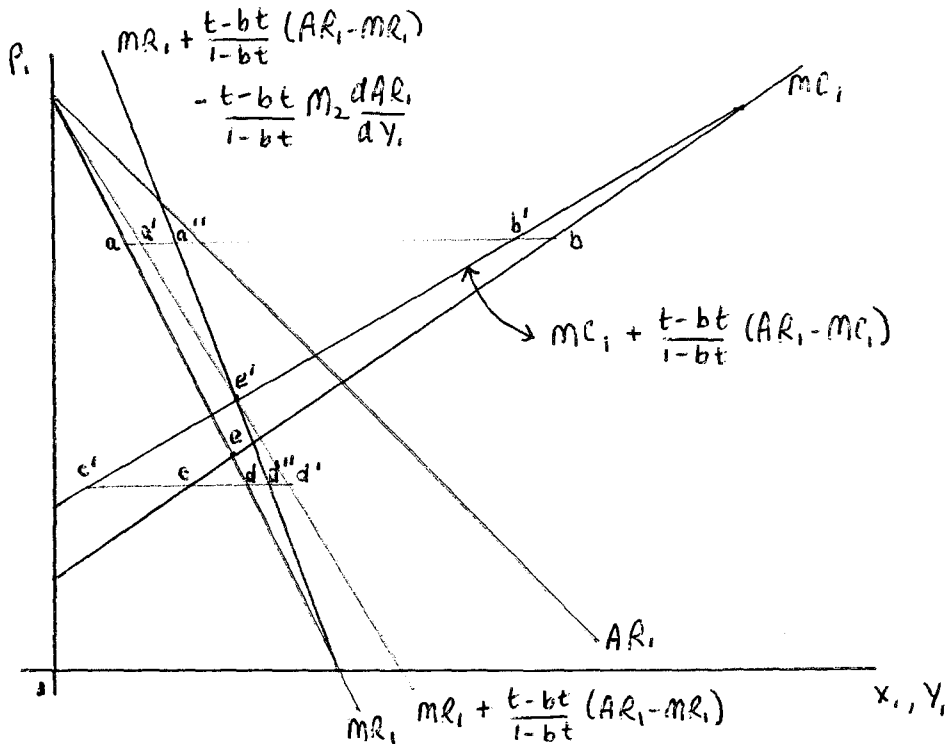
Where the final and original $MR_1$ curves intersect (at e') $MR_1$ equals $Pm_2$. Similarly where the final and original $MC_1$ curves intersect $MC_1$ equals $Pm_2$, (at e). Changing the tax rate does therefore not affect these intersection points; it merely causes rotations in the original curves. Raising the tax rate increases the differential between the tax rates levied on the two firms (assuming $0 < b < 1$ and b is fixed). As such it strengthens the ad valorem effects expanding trade since the wider the tax differential the more incentive there is to shift profits to the foreign firm. This causes larger rotations in $MR_1$ and $MC_1$. The specific effects are also stronger as the tax differential increases since the transfer price determines the allocation of trade profits and therefore directly affects the taxes levied on each firm. In summary the greater the tax differential the greater the distortions in trade flows (and therefore in output and sales reallocations).

The general conditions as given for $0 < b < 1$ illustrate the residence principle where firm 2 is a subsidiary. The MNE has an incentive to minimize transfer prices and/or the rate of repatriation. Lowering the transfer price results in lower intersections of the final and original $MR_1$ curves and $MC_1$ curves and therefore expands trade. Changes in the transfer price, however, do not affect the rotation of the curves, which is determined by t and by b. Lowering the rate of repatriation, b, does not alter the intersection points but does cause the curves to rotate downwards, expanding trade. If the MNE is free to set its transfer prices and to choose its remittance rate, the profits tax will in general cause an intrafirm trade expansion as the corporation uses transfers to minimize its tax obligations to government 1. If the corporation has control only over one variable (either $Pm_2$ or b) it will use the other to minimize

taxes. If country 1 refuses to permit exports to leave the country at very low transfer prices the MNE can reduce its dividend remittance for the same effect. If country 1 encourages profit repatriation flows the MNE can lower transfer prices. Where the host government imposes exchange controls on foreign currency outflows, this is of benefit to the corporation since it provides a legitimate reason for low repatriation rates and since there is less need to manipulate transfer prices.

By setting b equal to zero in the general condition the effects on the MNE of a change from the residence principle to the source principle (foreign profits are not taxed) are easily seen. The profit maximizing condition becomes:

$$(1 - t)MR_1 + tPm_2 = (1 - t)MC_1 + tPm_2 = MR_2 = MC_2$$

The corporation equates after tax marginal revenue and cost in firm 1 adjusted for the tax on transfers to the marginal revenue and cost in firm 2. The ad valorem effects shift $MR_1$ and $MC_1$ down by t percent, the tax differential, causing trade expansion. The specific effects shift $MR_1$ and $MC_1$ up by $tPm_2$. With a 'high' transfer price the specific effects dominate and trade contracts while with a 'low' $Pm_2$, trade expands. Since t must exceed t - bt/1 - bt for all $0 < t < 1$, the effect of changing from residence to source rule is the same as raising the tax rate since both increase the tax differential between the two firms. The intersections of the old and new $MR_1$ curves and of the $MC_1$ curves are unchanged but the rotations are larger.

Where firm 2 is a branch of the MNE and government 1 follows the residence principle, all profits of the MNE are taxed as earned at the

rate t. The equilibrium condition reduces to $MR_1 = MC_1 = MR_2 = MC_2$, which is the profit maximizing condition under no trade barriers. The international corporation is therefore in exactly the same position as a domestic monopolist earning all of its income within country 1. Under a pure profits tax the marginal revenue and marginal cost curves of the domestic monopolist are unaffected by the tax. As a result no changes in output, sales, or prices occur. The incidence of the tax falls wholly on the firm in the form of reduced profits. Under the residence-branch rule the MNE like an ordinary monopolist cannot avoid the tax through intrafirm transfers since all profits wherever declared face the same tax rate. The corporation has no incentive to use transfer pricing to avoid taxation. The pure profits tax falls wholly on the MNE and no changes in output, sales, or prices occur. Only in the residence-branch case does the standard profit tax on a monopolist obtain. Where the rate of repatriation is less than one, transfer pricing can be used to minimize taxes and therefore output, sales, and prices do change.

$Pm_2$ equals $AR_1$

Where the firm sets its transfer price equal to the price charged domestic customers, the profit maximizing condition becomes:

$$MR_1 + \frac{t-bt}{1-bt}(AR_1 - MR_1) - \frac{t-bt}{1-bt}M_2\frac{dAR_1}{dY_1} = MC_1 + \frac{t-bt}{1-bt}(AR_1 - MC_1) = MR_2 = MC_2$$

The profits tax has 2 basic effects where the transfer price equals $AR_1$:
1) Since $AR_1$ exceeds or equals $MR_1$ at all sales levels the $MR_1$ curve shifts up by an increasing amount as $Y_1$ rises. The tax therefore acts as an ad valorem subsidy to domestic sales and discourages exports compared to the no tax situation.

Since the corporation equates $MR_1$ to $MC_1$ in maximizing profits $MC_1$ must always lie below or equal $AR_1$ at the corresponding sales level. The tax therefore has an ad valorem tax effect on $X_1$, reducing production for any domestic sales volume. This discourages trade. We can call these effects the 'ad valorem' effects since the shifts vary with the slope of the curves.

2) The second effect is caused by the negative relationship between domestic sales and the transfer price. The effect is to shift $MR_1$ up over the export range ($M_2 > 0$); and down over the import range ($M_2 < 0$). Where exports are zero the new and old $MR_1$ curves intersect. Over the export range then the tax reduces trade by encouraging domestic sales. We can call this the 'rotation' effect.

Both effects are export reducing. In setting the transfer price equal to domestic sales price in the home country the MNE is choosing a high transfer price that results in most trade profits being allocated to firm 1. (Since $AR_1 \geq MC_1$ and $MC_1 \geq AC_1$ per unit profits of $AR_1 - AC_1$ are declared in firm 1.) The MNE, in maximizing profits, must reduce these intrafirm profits by reducing trade. This reduces the tax payments. The ad valorem effects are therefore trade reducing. The rotation effect further discourages trade due to the positive relationship between export price and export volume. For any output of $X_1$ as domestic sales decline exports increase and export price rises. Per unit profits of $Pm_2 - AC_1$ therefore increase as trade increases in firm 1. The higher are per unit profits the more taxes the MNE pays. This discourages trade since when exports decline per unit profits on trade declared in firm 1 fall while in firm 2 per unit profits increase. In firm 2 as exports from 1 decline domestic sales drop forcing a rise in selling price. Per unit profits

on trade increase since $Pm_2$ is falling and $P_2$ rising as trade declines. The rotation effect is therefore trade reducing.

This is shown in Figure IV.2 where firm 1 initially exports ab to firm 2. The tax first has an ad valorem subsidy effect on domestic sales, shifting up $MR_1$ to $MR_1 + (t - bt/1 - bt)(AR_1 - MR_1)$. This causes domestic sales to expand from a to a'. The ad valorem tax effect on $MC_1$ shifts up the curve, discouraging production which falls from b to b'. The rotation effect causes the new $MR_1$ curve to rotate in a clockwise manner through the new $MC_1$ curve, with the result that domestic sales increase from a' to a''. Intrafirm trade declines from ab to a''b'. The higher the tax rate the greater the reduction in trade. Under the source rule the condition for profit maximizing reduces to: $MR_1 + t(AR_1 - MR_1) - tM_2 dAR_1/dY_1 = MC_1 + t(AR_1 - MC_1) = MR_2 = MC_2$. Since t exceeds $t - bt/1 - bt$ the tax effects are stronger and trade is further reduced since profits declared in firm 2 now face no tax. Under the residence-branch rule the condition reduces to the profit maximizing condition under no trade barriers ($MR_1 = MC_1 = MR_2 = MC_2$). No changes in output, sales, or prices occur and the tax falls wholly on the corporation. Since the effects of shifting from residence-subsidiary to source rules is always to widen the tax differential between the two firms and therefore to increase the rotation of the curves, we can assume this general statement applies to all transfer pricing cases. Similarly moving from residence-subsidiary to residence-branch implies that the tax differential disappears. Both firms face the same tax rate and therefore the total incidence of the tax falls on the MNE whatever the transfer price. Since these basic changes of setting b = 0 or b = 1 cause exactly the same effects for all transfer prices they are ignored in the rest of this section.

$Pm_2$ equals $AC_1$

Where the transfer price equals domestic production costs of the exporter the profit-maximizing condition becomes:

$$MR_1 - \frac{t-bt}{1-bt}(MR_1 - AC_1) = MC_1 - \frac{t-bt}{1-bt}(MC_1 - AC_1) + \frac{t-bt}{1-bt}M_2\frac{dAC_1}{dX_1} = MR_2 = MC_2$$

The tax has both ad valorem and rotation effects:

1) Since the corporation equates $MR_1$ with $MC_1$ in maximizing profits $MR_1$ must equal or exceed $AC_1$ at the appropriate level of output. The tax therefore acts as a tax on domestic sales by shifting $MR_1$ down. This ad valorem effect reduces $Y_1$ for any $X_1$ and therefore is trade expanding. Since $MC_1 \geqslant AC_1$ the tax acts as an ad valorem subsidy to production increasing $X_1$ for any level of $Y_1$. This is trade expanding.

2) Over the export range the $MC_1$ curve rotates upwards discouraging production and therefore discouraging exports. Over the import range the curve rotates down encouraging $X_1$.

Where firm 1 is initially the exporter the tax effects are conflicting since the ad valorem effects are trade expanding while the rotation effect is trade contracting. The net result depends on the relative strengths of these two effects. Since the ad valorem cost effect

will outweigh the rotation effect the trade must expand in response to the tax as long as $Y_1$ exceeds zero.[17]

In setting $Pm_2$ equal to $AC_1$ the corporation allocates to firm 1 zero profits from trade and full profits of $(P_2 - AC_1)M_2$ to firm 2. Thus no tax is paid on intrafirm transfers in country 1 and only bt percent in country 2. This is trade expanding since the MNE through trade can shift profits unambiguously to firm 2. The trade diverting rotation effect is caused by the positive relationship between $X_1$ and $Pm_2$. As output expands for any volume of domestic sales exports rise and the transfer price increases. In firm 2 as trade increases for any volume of $X_2$ sales increase and domestic price declines. That is, as trade increases the per unit cost of firm 2's imports increases while the selling price on these imports falls. Per unit trade profits decline in firm 2. Since the MNE is attempting to increase per unit profits in firm 2 trade must decline to have this effect.

The tax effects of setting $Pm_2 = AC_1$ are illustrated in Figure IV.3. Trade moves from ab to a'b' due to the ad valorem effects and from a'b' to a'b'' because of the rotation effect. Trade thus expands. At f the ad valorem revenue and rotation effects cancel ($Y_1 = 0$).

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17. We must compare $-\frac{t-bt}{1-bt}(MC_1 - AC_1)$ with $+\frac{t-bt}{1-bt}M_2\frac{dAC_1}{dX_1}$.

$$\frac{t-bt}{1-bt}(MC_1 - AC_1) \gtreqless \frac{t-bt}{1-bt}M_2\frac{dAC_1}{dX_1}$$

$$MC_1 - AC_1 \gtreqless (X_1 - Y_1)\frac{dAC_1}{dX_1}$$

but $\frac{dAC_1}{dX_1} = (MC_1 - AC_1)\frac{1}{X_1}$ or $MC_1 - AC_1 = (\frac{dAC_1}{dX_1}) \cdot X_1$

so substituting $\frac{dAC_1}{dX_1} \cdot X_1 \gtreqless (X_1 - Y_1)\frac{dAC_1}{dX_1}$

$$X_1 \gtreqless X_1 - Y_1$$

The ad valorem effect dominates as long as $Y_1 > 0$; that is, as long as firm 1 continues to sell in its domestic market.

## Figure IV.3

### Tax Effects on Firm 1 Where $Pm_2$ Equals $AC_1$



$mc_1$

$mc_1 - \frac{t-bt}{1-bt}(mc_1 - AC_1) + \frac{t-bt}{1-bt} M_2 \frac{dAC_1}{dx_1}$

$mc_1 - \frac{t-bt}{1-bt}(mc_1 - AC_1)$

$AC_1$

$AR_1$

$mR_1 - \frac{t-bt}{1-bt}(mR_1 - AC_1)$

$mR_1$

$P_1$

$X_1, Y_1$
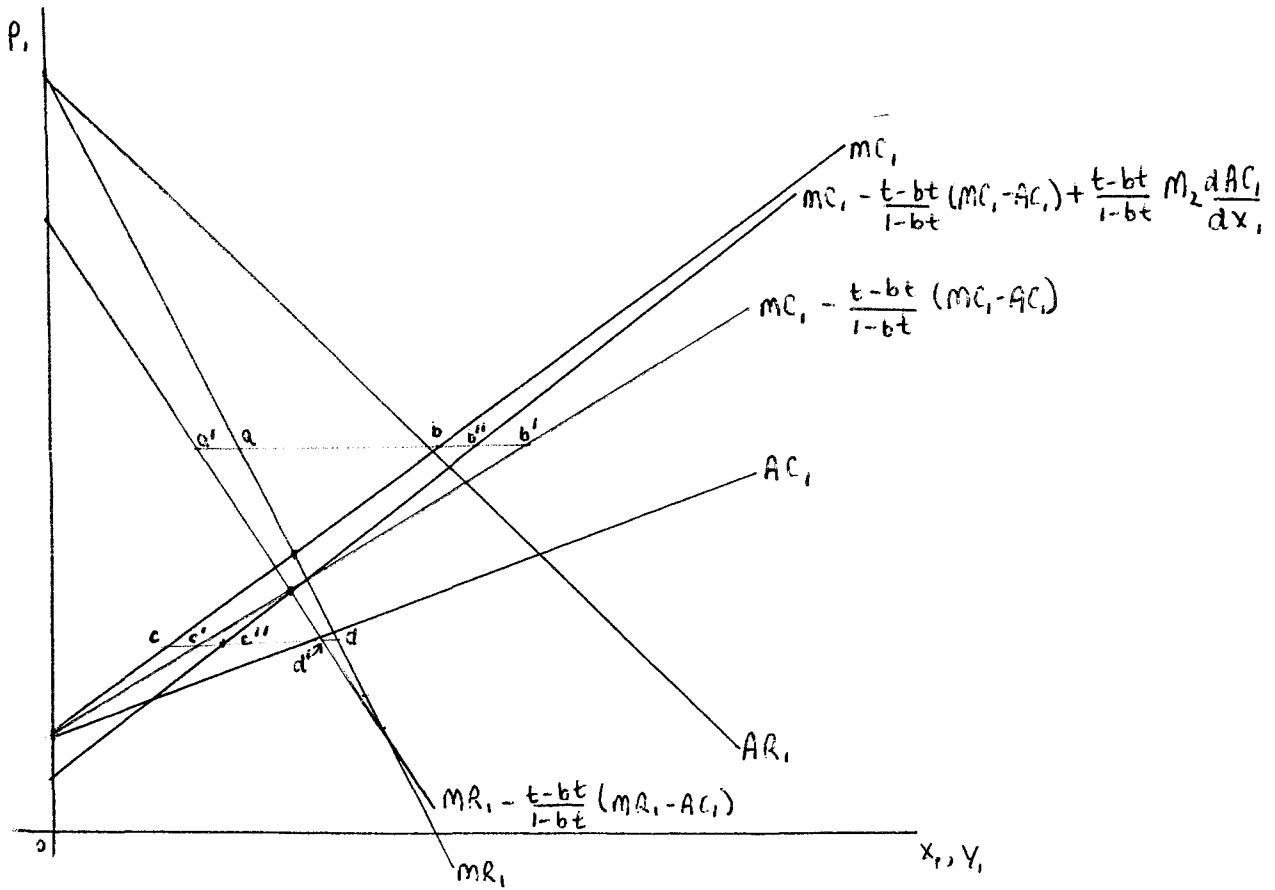
## Figure IV.4

### Tax Effects on Firm 2 Where $Pm_2$ Equals $AR_2$



$P_2$

$mc_2$

$mc_2 - \frac{t-bt}{1-bt}(AR_2 - mc_2)$

$AR_2$

$mR_2 - \frac{t-bt}{1-bt}(AR_2 - mR_2) + \frac{t-bt}{1-bt} M_1 \frac{dAR_2}{dY_2}$

$mR_2$

$mR_2 - \frac{t-bt}{1-bt}(AR_2 - mR_2)$

$X_2, Y_2$
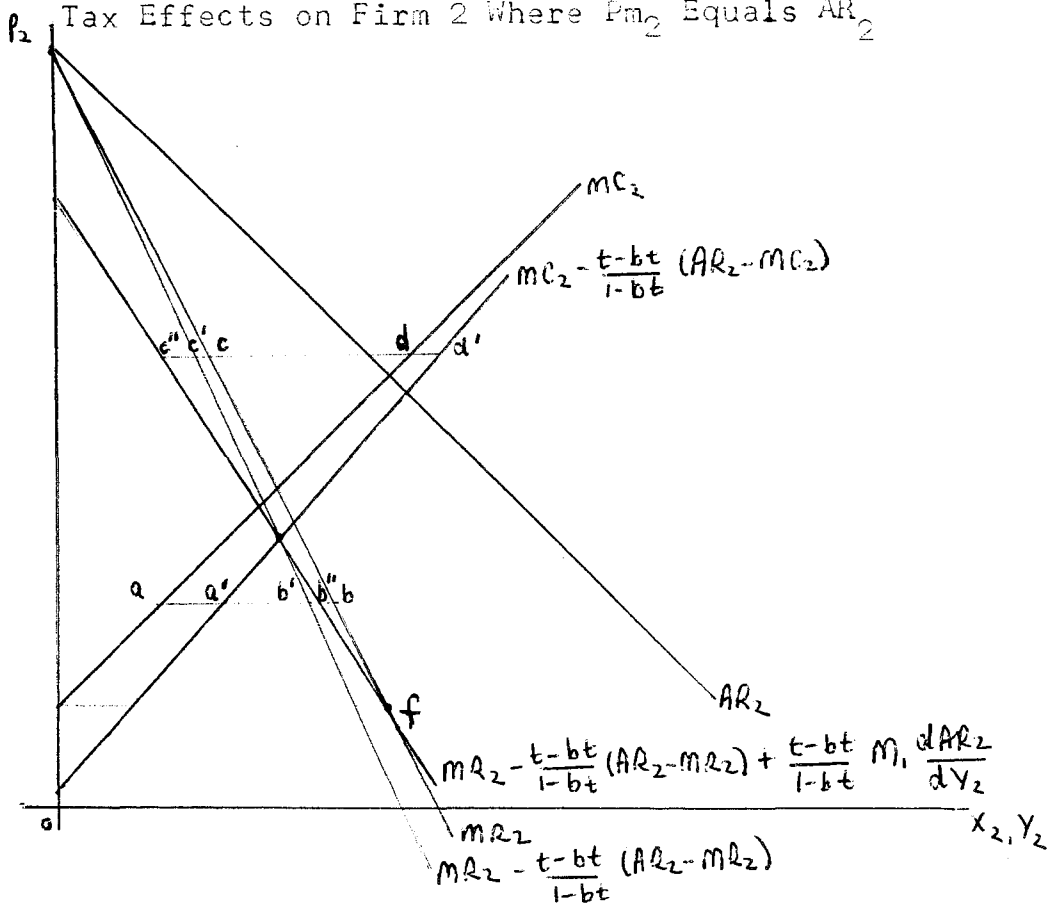
$Pm_2$ equals $MC_1$

With the transfer price equal to marginal production cost the profit maximizing condition becomes:

$$MR_1 - \frac{t-bt}{1-bt}(MR_1 - MC_1) = MC_1 - \frac{t-bt}{1-bt}(MR_1 - MC_1) + \frac{t-bt}{1-bt}M_2\frac{dMC_1}{dX_1} = MR_2 = MC_2$$

Since the corporation equates $MR_1$ with $MC_1$ in maximizing profits the ad valorem effects are zero. The only effect is the rotation one which shifts $MC_1$ up over the export range, discouraging exports.

In setting $Pm_2 = MC_1$ profits on trade are declared in both firms. The tax acts as a tax on domestic sales shifting $MR_1$ down $t - bt/1 - bt$ % and as a subsidy to domestic production of $t - bt/1 - bt$ %. The transfer price is kept equal to marginal cost at each output level and therefore also equal to marginal revenue at the appropriate sales level. The taxed transfer price acts as a subsidy to domestic sales just offsetting the tax effect and as a tax on production just offsetting the subsidy effect. The transfer price therefore only indirectly affects total profits through the slope of the $MC_1$ curve. As production of $X_1$ increases for any $Y_1$, exports rise and export price rises. There is a positive relation between $M_2$ and $Pm_2$. Since the rise in $MC_1$ exceeds the rise in $AC_1$ per unit profits declared in firm 1 increase. As firm 2's imports increase, its sales rise for any $X_2$ and domestic price declines. Therefore per unit profits in firm 2 decline. Since the MNE attempts to shift per unit profits to firm 2 this is export reducing.

This can be compared with a fixed transfer price based on marginal cost under free trade. When $Pm_2 = MC_1$, the marginal cost fixed at the level under no trade barriers, the ad valorem and specific effects

cancel so that trade remains unchanged. Any fixed $Pm_2$ based on a level of $MC_1$ other than the free trade level would, however, cause trade changes. With a variable $MC_1$ the ad valorem variable effects cancel so there is no trade effect. However, the rotation effect remains to contract trade.

$Pm_2$ equals $AR_2$

The profit condition becomes:

$$MR_1 = MC_1 = MR_2 - \frac{t-bt}{1-bt}(AR_2 - MR_2) + \frac{t-bt}{1-bt}M_1\frac{dAR_2}{dY_2} = MC_2 - \frac{t-bt}{1-bt}(AR_2 - MC_2)$$

The effects of the tax are:

1) Since $AR_2$ exceeds or equals $MR_2$ at all sales levels $MR_2$ shifts down by the tax on sales. This reduces $Y_2$ and increases imports from firm 1 for any $X_2$.

Since the MNE equates $MR_2 = MC_2$ in maximizing profits $AR_2$ exceeds or equals $MC_2$ and the tax acts as a subsidy to domestic production, reducing imports.

2) Where firm 2 is the importer $M_1$ is negative and therefore over this range $MR_2$ shifts up. $Y_2$ increases for any $X_2$ and therefore encourages imports. The $MR_2$ curve rotates counterclockwise through the point where $M_1 = 0$.

The ad valorem effects of the tax discourage imports from firm 1 while the rotation effect encourages imports. The net result depends on the strengths of the two ad valorem compared to the rotation effects. Because the ad valorem effect will dominate the rotation effect

trade contracts.[18] This is shown in Figure IV.4 where the tax causes imports to fall from ab to a'b''. The ad valorem revenue and rotation effects cancel one another at f where domestic production of $X_2$ ceases.

Since in the no trade barrier case the MNE equates $MR_1 = MC_1 = MR_2 = MC_2$, $AR_2$ must lie above or equal $MC_1$ and therefore $AC_1$. That is, all intrafirm trade profits are declared in firm 1 when $Pm_2 = AR_2$. This discourages trade. As firm 2's imports increase for any $X_2$ domestic sales rise and $AR_2$ falls. That is the $M_2 - Pm_2$ relationship is negative. Per unit trade profits in firm 1 are unaffected since by pricing imports at their final selling price no trade profits are declared in firm 2. In firm 1 as output expands $AC_1$ rises. For any $Y_1$ level this increases exports and causes the transfer price to decline. Per unit trade profits declared in firm 1 therefore fall since their cost has risen and export price fallen. This is export encouraging.

$Pm_2$ equals $AC_2$

The profit maximizing condition becomes:

---

18.

$$\frac{t-bt}{1-bt}(AR_2 - MR_2) \gtreqqless \frac{t-bt}{1-bt}M_1\frac{dAR_2}{dY_2}$$

$$AR_2 - MR_2 \gtreqqless (X_2 - Y_2)\frac{dAR_2}{dY_2}$$

but $\dfrac{dAR_2}{dY_2} = (MR_2 - AR_2)\dfrac{1}{Y_2}$ or $MR_2 - AR_2 = \dfrac{dAR_2}{dY_2}(Y_2)$

substituting $\quad \dfrac{-dAR_2}{dY_2} \cdot Y_2 \gtreqqless (X_2 - Y_2)\dfrac{dAR_2}{dY_2}$

$$-Y_2 \gtreqqless X_2 - Y_2$$

$$Y_2 \gtreqqless Y_2 - X_2$$

The ad valorem effect dominates so that trade contracts as long as $X_2 > 0$, that is, as long as firm 2 produces some output.

$$MR_1 = MC_1 = MR_2 + \frac{t-bt}{1-bt}(MR_2 - AC_2) = MC_2 + \frac{t-bt}{1-bt}(MC_2 - AC_2) - \frac{t-bt}{1-bt}M_1\frac{dAC_2}{dX_2}$$

The effects of the tax are:

1) the tax acts as a subsidy to domestic sales by shifting up $MR_2$ since $MR_2 = MC_2$. For any $X_2$ this is trade expanding.

The tax acts as an ad valorem tax on domestic production and therefore is trade increasing.

2) Where firm 2 is the importer the $MC_2$ curve shifts up which reduces output and encourages imports from firm 1.

Both tax effects are trade expanding. Since the MNE equates $MR_1 = MC_1 = MR_2 = MC_2$ and $AC_2$ lies at or below the level of $MC_2$ it must also lie at or below $MC_1$. Therefore very low trade profits are declared in firm 1 which encourages trade. Also as firm 2 imports more for a given sales volume domestic output must fall and $AC_2$ decline. That is, the $Pm_2 - M_2$ relationship is negative. In firm 2 per unit trade profits rise since $AC_2$ falls for a constant $P_2$. In firm 1 as trade expands $AC_1$ rises as $X_1$ increases and $AC_2$ falls so per unit profits declared in firm 1 decline. This is trade increasing.


## Firm 2 is Initially the Exporter

As shown in Appendix IV.1 if $Pm_1$ equals $Pm_2$ the profit maximizing conditions are unchanged by reversing the initial trade flow. In most cases the effect of the tax is exactly the opposite comparing the firm 1 exporter situation to firm 2 exporter situation. In the fixed transfer price case there are conflicting ad valorem and specific effects. In the variable cases there are ad valorem and rotation effects. Trade

is encouraged or discouraged depending on where trade profits are declared and how per unit trade profits are affected by changes in trade flows.

Obviously when firm 1 is the exporter the transfer price chosen by the MNE may not be the transfer price that would have been selected if firm 2 had been the exporting firm. Trade reversals may cause changes in the MNE's transfer pricing policies that, in turn, may cause further changes in trade flows. For example, in the fixed $Pm_2$ case, a high transfer price causes trade contraction, and if firm 1 is no longer the low cost--low revenue firm as a result of the tax, the trade flow will reverse with firm 2 becoming the exporter. If firm 2 applies the same transfer price there are no further trade changes. But if $Pm_1$ is higher or lower than $Pm_2$ there will be secondary effects that could possibly reverse trade again. In order to simplify the present analysis we ignore these secondary effects by assuming $Pm_1$ equals $Pm_2$. The probability that $Pm_1$ will approximately equal $Pm_2$ is, however, increased where both firms use arm's length transfer prices or where cost conditions are similar and cost-based prices apply.

With a fixed transfer price the profit maximizing condition is unchanged by the substitution of $Pm_1$ for $Pm_2$. The ad valorem effects are import reducing by firm 1 and the specific effects import increasing. The higher the transfer price the less profits declared in firm 1 and the more imports are encouraged. In Figure IV.1 the ad valorem effects reduce imports from cd to c'd' while the specific effects increase trade from c'd' to c''d''. The net effect depends on the strengths of the shifts.

Where $Pm_1 = AR_1$, the ad valorem effects increase firm 1's imports while the rotation effect reduces trade. Since the rotation

effect does not outweigh the ad valorem revenue effect until domestic production of $X_1$ falls to zero, in general, the profits tax increases imports by firm 1. The high transfer price means zero intrafirm trade profits are shown in firm 1. And the negative $Pm_1 - M_1$ relation implies as trade falls per unit profits increase in firm 2 which discourages trade. In IV.2 the tax causes intrafirm trade to expand from cd to c'd''.

Where $Pm_1 = AC_1$, both effects are import reducing. The low transfer price means high trade profits are declared in firm 1 and the negative $Pm_1 - M_1$ relation also discourages trade. In Figure IV.3 trade falls from cd to c'd' and then to c''d'.

If $Pm_1 = MC_1$, there are no ad valorem effects and the rotation effect is import reducing since the $Pm_1 - M_1$ relation is negative.

Where $Pm_1 = AR_2$, all effects are trade expanding. Setting a high transfer price means low profits declared in firm 1. The $Pm_1 - M_1$ relation is positive which means increasing trade allocates larger per unit profits to firm 2 and smaller per unit profits to firm 1. In Figure IV.4 trade expands from cd to c''d'.

If $Pm_1 = AC_2$, the ad valorem effects discourage exports by firm 2 while the rotation effect encourages trade. The rotation effect does not offset the ad valorem cost effect until domestic sales of $Y_2$ fall to zero and all of firm 2's production is for export. Where domestic sales are positive the net result is trade reducing. The low transfer price allocates large profits to firm 1. The positive $Pm_1 - M_1$ relation encourages trade.

Table IV.1

Summary Table of Pure Profit Tax Effects on Trade

| Transfer Price | Ad Valorem Effects | Specific Effects | Rotation Effect | Net Result |
|---|---|---|---|---|
| **I.  Firm I is the Exporter** | | | | |
| fixed $Pm_2$ | trade expands | trade contracts | ——————— | ambiguous |
| $AR_1$ | trade contracts | ——————— | trade contracts | trade contracts |
| $AC_1$ | trade expands | ——————— | trade contracts | [1]trade expands |
| $MC_1$ | no change | ——————— | trade contracts | trade contracts |
| $AR_2$ | trade contracts | ——————— | trade expands | [2]trade contracts |
| $AC_2$ | trade expands | ——————— | trade expands | trade expands |
| **II.  Firm 2 is the Exporter** | | | | |
| fixed $Pm_1$ | trade contracts | trade expands | ——————— | ambiguous |
| $AR_1$ | trade expands | ——————— | trade contracts | [3]trade expands |
| $AC_1$ | trade contracts | ——————— | trade contracts | trade contracts |
| $MC_1$ | no change | ——————— | trade contracts | trade contracts |
| $AR_2$ | trade expands | ——————— | trade expands | trade expands |
| $AC_2$ | trade contracts | ——————— | trade expands | [4]trade contracts |

[1]Trade may contract when domestic sales cease in firm 1.

[2]Trade may expand when domestic production ceases in firm 2.

[3]Trade may contract when domestic production ceases in firm 1.

[4]Trade may expand when domestic sales cease in firm 2.

## Resource Allocation Effects of Profit Taxation

### Output and Sales Allocation Effects

The previous section discussed the general direction of trade

effects when a tax was levied on pure profits under various transfer

prices. This section examines in more detail the effects on output

and sales allocation, and on consumer prices of both fixed and variable

transfer pricing under a profits tax. The tax may cause trade to expand,

to decline, to cease, and even to reverse. Two cases are used for illus-

tration. In case 1 the MNE sets a fixed transfer price that causes

trade to decline. In case 2 the MNE sets $Pm_2 = AR_1$ and a trade reversal

occurs.

### Trade Contraction Under a Fixed
### Transfer Price and Profits Tax

Where firm 1 is initially the exporter the profits tax has two

ad valorem effects that encourage trade and two specific effects that

discourage trade. The net effect depends on the transfer price; the

higher the price, the more likely is intrafirm trade to decline.

Figure IV.5 shows the marginal cost and marginal revenue curves

for firms 1 and 2. Initially firm 1 exports ab (equals a'b') to firm 2.

The tax causes $MR_1$ and $MC_1$ to rotate downwards expanding trade, and then

to shift upward by the specific transfer price effects. In this case the

final and original curves intersect above the original trading level ab,

which has a net trade reducing effect. Firm 1 is no longer able to offer

the same volume of exports to firm 2. The new trade volume cd (equals c'd')

is found by moving up $MR_2$ and $MC_2$ until the desired imports of firm 2

equal the desired exports of firm 1. Firm 2 now sells at a higher price,

and produces more domestically. Firm 1 sells more at home at a lower price and produces less domestically.

If the new and old $MR_1$ curves had intersected at a, and the new and old $MC_1$ curves at b, (the level of $MC_1$ and $MR_1$ under free trade) trade would have been unchanged. Therefore output and sales would have been unaffected. The new trade volume would be found by moving down the MR and MC curves of firm 2 until the import demand and export supply were equal. Trade would expand in this situation. If the new $MR_1$ and $MC_1$ curves intersected at the same level as the $MR_2$ and $MC_2$ curves intersect, trade would cease. Marginal revenue is equaled between both firms and marginal cost is also equalized. Therefore there are no gains from shifting output and sales between firms. If the new $MR_1$ and $MC_1$ intersect above this level, firm 2 becomes the exporter as the trade flow reverses. Firm 2 becomes the 'low cost-low revenue' firm and hence the exporter.

### Trade Reversal Under $Pm_2 = AR_1$ with a Profits Tax

Figure IV.6 shows the marginal cost and revenue curves of firms 1 and 2. Firm 1 initially exports ab (equals a'b') to firm 2. The ad valorem effects of the profits tax cause $MR_1$ and $MC_1$ to shift upwards, decreasing trade. The rotation effect causes a clockwise rotation through e, the new intersection point of after tax $MR_1$ and $MC_1$ curves. This new intersection point lies above the intersection point of $MR_2$ and $MC_2$ and therefore firm 2 becomes the low cost-low revenue firm. Firm 2 now exports c'd' (equals cd) to firm 1. Sales of $Y_2$ fall causing $P_2$ to rise while domestic production of $X_2$ expands and the difference $X_2' - Y_2'$ is sold to firm 1. In firm 1 domestic sales increase so $P_1$ falls and output

Figure IV.5
Trade Contraction Under a Profits Tax With a Fixed $Pm_2$
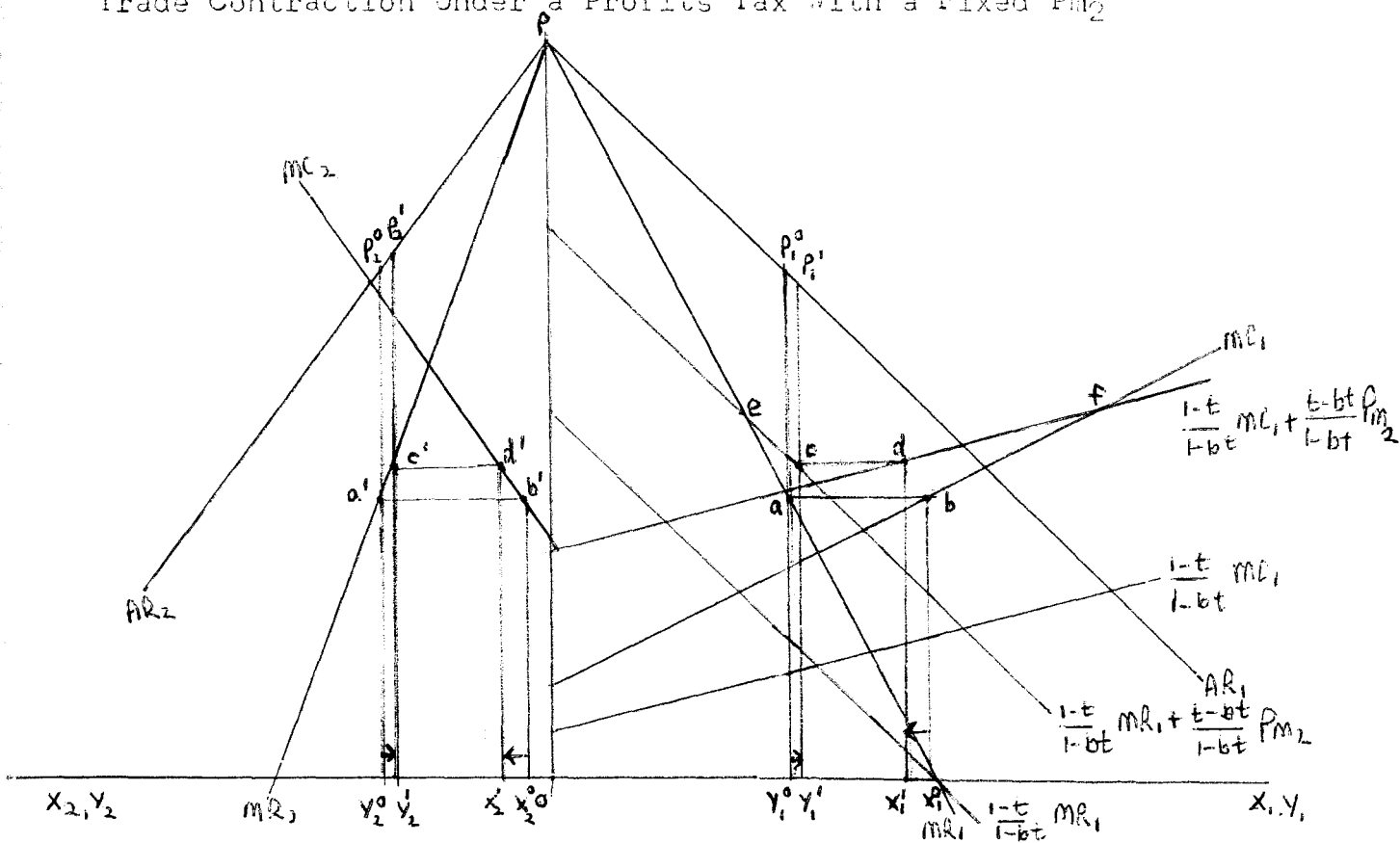


Figure IV.6
Trade Reversal Under a Profits Tax Where $Pm_2 = Pm_1 = AR_1$
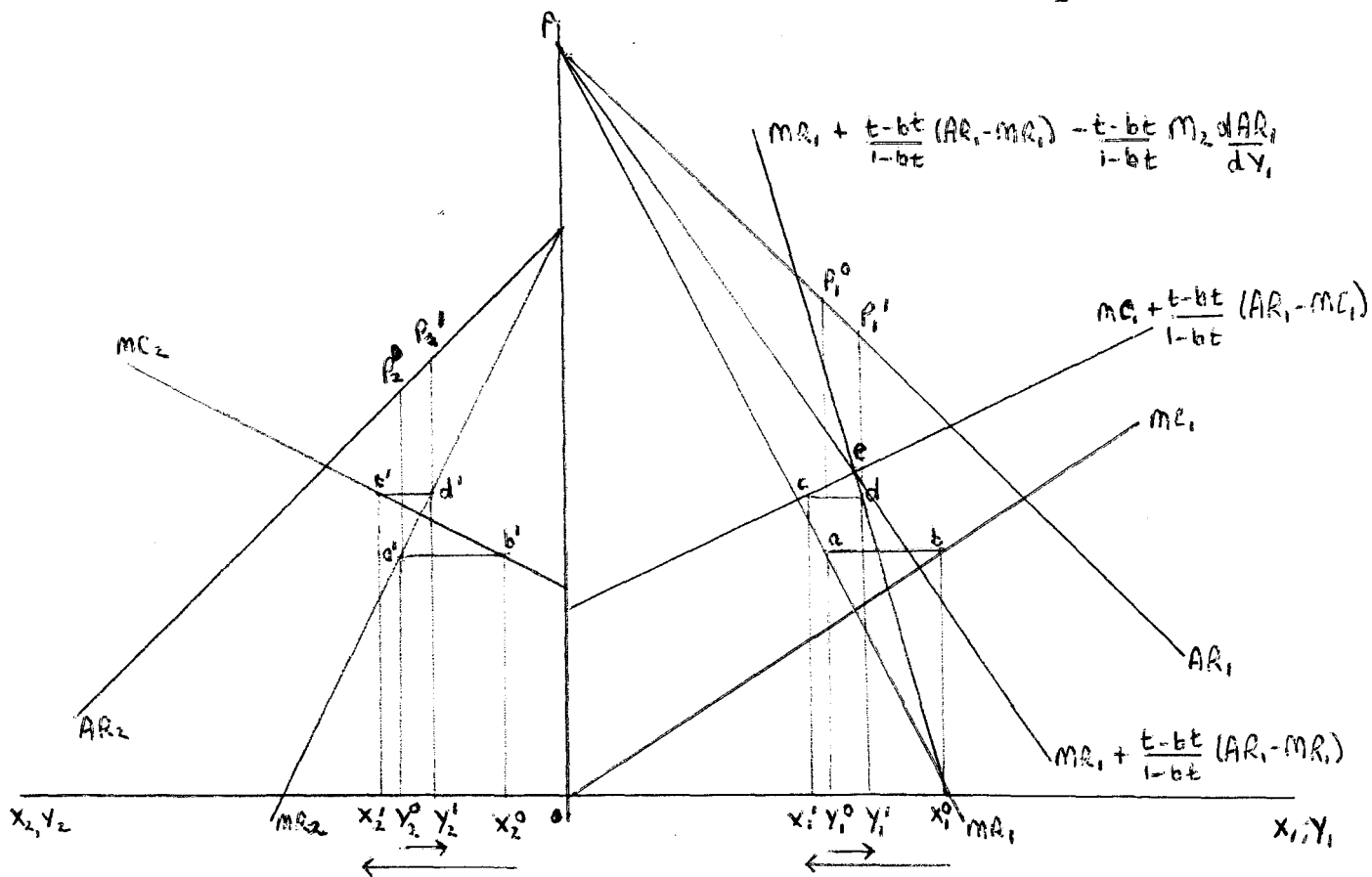
of $X_1$ declines; the difference $Y_1' - X_1'$ is imported. If the new inter-section of $MR_1$ and $MC_1$ after tax had occurred at the same level as the $MR_2$ and $MC_2$ intersection trade would have ceased; if below it, firm 1 would have exported a smaller volume to firm 2 but would have remained the exporter. The closer are the cost and revenue conditions between the two firms the more likely is a trade reversal where a high transfer price is set. The closer the conditions of revenue and cost the smaller the initial trade volume and the more likely trade is to reverse or cease. This possibility of reversal could not occur under the tariff since the tariff affected trade flows in only one direction. The tax, however, applies in both directions. If firm 2 had been initially the importer, setting a low $Pm_1$ could cause a trade reversal. Governments, in encour-aging the use of "arm's length pricing" may be encouraging trade reversals in situations where only the home country levies a profits tax. If govern-ment 1 demands that exports be priced the same as domestic sales prices the resulting trade decline may be large enough to cause trade to cease or reverse. If the importing country accepts a high transfer price for tariff purposes or because of antidumping legislation intrafirm trade may become unprofitable. Where the source rule is followed these trade effects are stronger while under branch rules no trade changes occur as the corporation absorbs the full burden of the tax.

### Factor Utilization Effects of the Pure Profits Tax

As shown in Appendix IV.2 the profits tax drives a wedge between the marginal revenues of the two firms such that:

$$\frac{1-t}{1-bt}MR_1 + \frac{t-bt}{1-bt}Pm_2 - \frac{t-bt}{1-bt}M_2\frac{dPm2}{dY_1} + \frac{t-bt}{1-bt}M_2\frac{dPm2}{dY_2} = MR_2$$

When there are no trade barriers the international corporation equates $MR_1$ with $MR_2$ in maximizing profits. With a profits tax three tax-induced effects occur to separate $MR_1$ and $MR_2$. First the MNE adjusts the marginal revenues for the tax rates so as to equate the after tax marginal revenues of the two firms. Since the tax falls on all profits of firm 1 and only on b percent of firm 2's net revenues, in order to equate $(1-t/1-bt)MR_1$ to $MR_2$, $MR_1$ must have risen relative to $MR_2$ compared to the no trade barrier situation. That is, where firm 1 was initially the exporter domestic sales of $Y_1$ must have declined due to the tax, and therefore exports expanded. The ad valorem effect of the tax is trade creating. Second the MNE adjusts $MR_1$ for the effect the transfer price has on after tax profits of each firm. The variable $t-bt/1-bt$ represents the tax differential between the two firms divided by the after tax return rate to firm 2. That is, where t exceeds bt, setting a high transfer price allocates the largest share of trade profits to the high tax firm and reduces profits. The effect of the transfer price is to reduce trade as long as a tax differential between the two firms exists. Third where a variable transfer price is used by the MNE the corporation must also consider how per unit trade profits are affected by the expansion or contraction of trade. A transfer price related to $Y_1$, for example, $AR_1$, implies a positive $Pm_2 - M_2$ relationship that discourages trade. As trade expands the transfer price rises, allocating more profits to the high tax firm and less to the low tax firm. Basing the transfer price on $Y_2$, for example, $AR_2$, results in a negative $Pm_2 - M_2$ relation that encourages trade by allocating larger profits to the lower taxed firm. Therefore there are three possible wedges that can separate $MR_1$ and $MR_2$ under a profits tax: the direct tax effect on marginal revenues, the tax differential effect on transfer prices, and the effect of a variable transfer price under tax differentials.

These same three components can be seen in the factor utilization conditions. Consider the after tax labor hiring conditions for the MNE. The MNE should hire labor and allocate it between the two firms such that:

$$\frac{1-t}{1-bt}\frac{MC1_1}{MP1_1} + \frac{t-bt}{1-bt}Pm_2 + \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dX_1} - \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dX_2} = \frac{MC1_2}{MP1_2}$$

Under no trade barriers the corporation hired labor and allocated it between the two firms until the ratio of marginal labor cost to marginal labor productivity was equal between the two firms. Where the factors were purchased in perfectly competitive markets this became: $Pl_1/MP1_1 = Pl_2/MP1_2$.

With the profits tax the MNE must adjust its hiring conditions for three effects of the tax. First the ratio of marginal factor cost to marginal factor productivity is adjusted for the after tax return in each firm. Where t exceeds bt this implies the ratio must have risen in firm 1 versus firm 2 compared to the no barrier situation. That is, either $MC1_1$ rose or $MP1_1$ declined or both occurred relative to firm 2. Where labor is purchased under competitive conditions $Pl_1$ is constant in the eyes of the firms and therefore the tax causes adjustments in marginal productivities only. Declining marginal products of $L_1$ relative to $L_2$ implies more factors must have been hired by firm 1 and less by firm 2. Where firm 1 is initially the exporter this implies an expansion in intra-firm trade. Second under a profits tax the transfer price can be used to minimize taxes and as such it affects the factor hiring conditions. The higher the transfer price the more profits allocated to firm 1. Therefore this effect reduces trade. Third where the price is a function of output

in either firm changes in trade will cause changes in per unit trade profits declared between the two firms. With $Pm_2 = AC_1$ the effect is trade contracting since the $Pm_2 - M_2$ relation is positive. With $Pm_2 = AC_2$ trade expands since trade and export prices are inversely related. Whether the net effect is trade expansion (with more output by firm 1 and more factors hired) or contraction (with more output and factors hired by firm 2) depends on the relative strengths of these three effects. Although the tax does not affect factor prices (if the elasticity of factor supply is infinite to the MNE) it does distort resource allocation by distorting marginal productivities.

Where government 1 taxes on the residence rule and firm 2 is a branch of the MNE all profits are taxed at the same rate. Therefore there is no change in factor hiring conditions. Output, sales and their allocations are unchanged.

Where government 1 applies the source rule and does not tax firm 2's profits the effects on factor hiring are stronger. Profits declared in firm 1 face taxes at t percent whereas profits declared in firm 2 face no tax. The ad valorem effect which encourages trade is stronger since the urge to transfer profits to firm 2 is stronger. The higher the transfer price the greater the tendency to reduce trade under the source principle, since $t > t-bt/1-bt$. The variable transfer pricing effect is also stronger.

In the capital market mobility ensures that the return to capital is everywhere the same. From a macroeconomic viewpoint corporate profits tax differentials between countries will cause capital flows until the after tax returns are equalized, that is, until $(1-t)Pk_1 = (1-bt)Pk_2$. This implies global nonneutrality since the pretax returns are now no

longer equal in the two countries.  The marginal productivities of capital

have been everywhere equalized but as long as tax differentials persist

the global and private rates of return on foreign investment are not

equalized.[19]  This induces a distortion in the capital market with too

much capital allocated to the country with the lower tax rate.

From a microeconomic view, however, since the MNE is assumed

to rent and not own any capital and to face a perfectly elastic supply

of capital curve, the price of capital is fixed.  When the corporate profits

tax is levied on the MNE, capital productivities, not capital returns, are

affected.  (Of course, if all MNE's are taxed and they face an upward-

sloping supply of capital curve, pretax returns will change.  But this is

seen as an outside datum by this MNE on which it has no direct influence.)

In this model pretax capital returns are still equalized after the tax

$(Pk_1 = Pk_2)$, but the marginal productivities will differ depending on

the tax differential and on the transfer price.  Unrelated firms, faced

by a corporate profits tax and a fixed capital price, would base their

factor hiring decisions on marginal productivities and taxes only.  When

a multinational is faced with tax differentials the transfer price also

affects the factor utilization conditions since it affects trade flows

and thus the allocation of output between the two firms.  Transfer pricing

therefore not only affects total profits and the distribution of these

profits; trade flows and the allocation of sales and output; it also

affects the marginal productivities and volume of factors hired by each

affiliate.

19.   P. B. Musgrave, Direct Investment Abroad and the Multinationals:
      Effects on the United State's Economy, 1974, pp. xiv-xvi.

Summary of the Resource Allocation Effects

These last two sections on the effects of a pure profits tax on the profit-maximizing decisions of the multinational and on its factor utilization conditions are perfectly general sections. The conclusions arrived at depend solely on two factors:

1) the tax differential between the two firms

2) the transfer pricing policy of the multinational.

Knowing the tax differential and the transfer price we can predict whether trade will expand, contract or reverse; whether prices will be higher or lower; whether $X_1$, $X_2$, $Y_1$, and $Y_2$ rise or fall; whether more or less factors are hired by each firm. Since the tax differential, and not the absolute tax rates, influence the behaviour of the MNE; this analysis can be widened to include cases where both countries tax pure profits. In these cases the differential may be positive (the home rate is higher), negative (the foreign rate is higher) or zero. However, the results of these two sections can easily be reinterpreted to include negative tax differentials. Therefore in the following chapters sections on profit maximization effects and factor utilization conditions are omitted.

The Gains from Trade Under a Profits Tax and their Division

The Gains from Trade

There are four groups affected by intrafirm trade under a pure profits tax: the producer, consumers, factors, and the government levying the tax. Let us examine the gains or losses of each group separately.

## Producer Gains from Trade

The tax causes producer gains to decline by more than the actual tax costs for all cases except full repatriation. This is due to the misallocation of resources caused by the tax. The decline in gains may be shifted forward to consumers or backward to factors (if factor prices can be affected) or be absorbed by the corporation. The decline in gains occurs whether trade expands, contracts, ceases or reverses. It is also not dependent on whether the transfer price used is high or low, or fixed or variable. The fall in gains may be larger in certain cases than in others but, in general, profits of the MNE fall by more than the tax revenues paid to government 1. Proof of this is illustrated in the case below where a fixed transfer price results in trade expansion.

Before the tax the corporation maximizes profits by equating $MR_1 = MR_2 = MC_1 = MC_2$. In Figure IV.7 this occurs when firm 1 exports $X_1^o - Y_1^o$ or ab to firm 2. Since the new and old $MR_1$ and $MC_1$ curves after the tax intersect below ab trade expands. We can show this as a three step procedure. First the MNE reallocates sales between the two firms until $MR_2$ equals the after tax $MR_1$. This occurs at c = c' where the fall in $Y_1$ is offset by an equal rise in $Y_2$. The gain in total revenue to the MNE is the area under $MR_2$ over the change in $Y_2$. This area is $+a'c'\Delta Y_2$. The fall in total revenue is the area under the pretax $MR_1$ curve over the fall in $Y_1$ or the area $-ac''\Delta Y_1$. Since c'' must lie above a (the $MR_1$ curve is downward sloping) there is a net fall in total revenue of the triangle cac'' caused by the reallocation of sales. Second the MNE reallocates production so as to equate $MC_2$ with the after tax $MC_1$. This occurs at d = d' where the fall in firm 2's output equals the rise in firm 1's output. The fall in total cost to the MNE is the area under

127.

Figure IV.7

Producer Gains from Trade with a Fixed Transfer Price - Trade Expansion Case
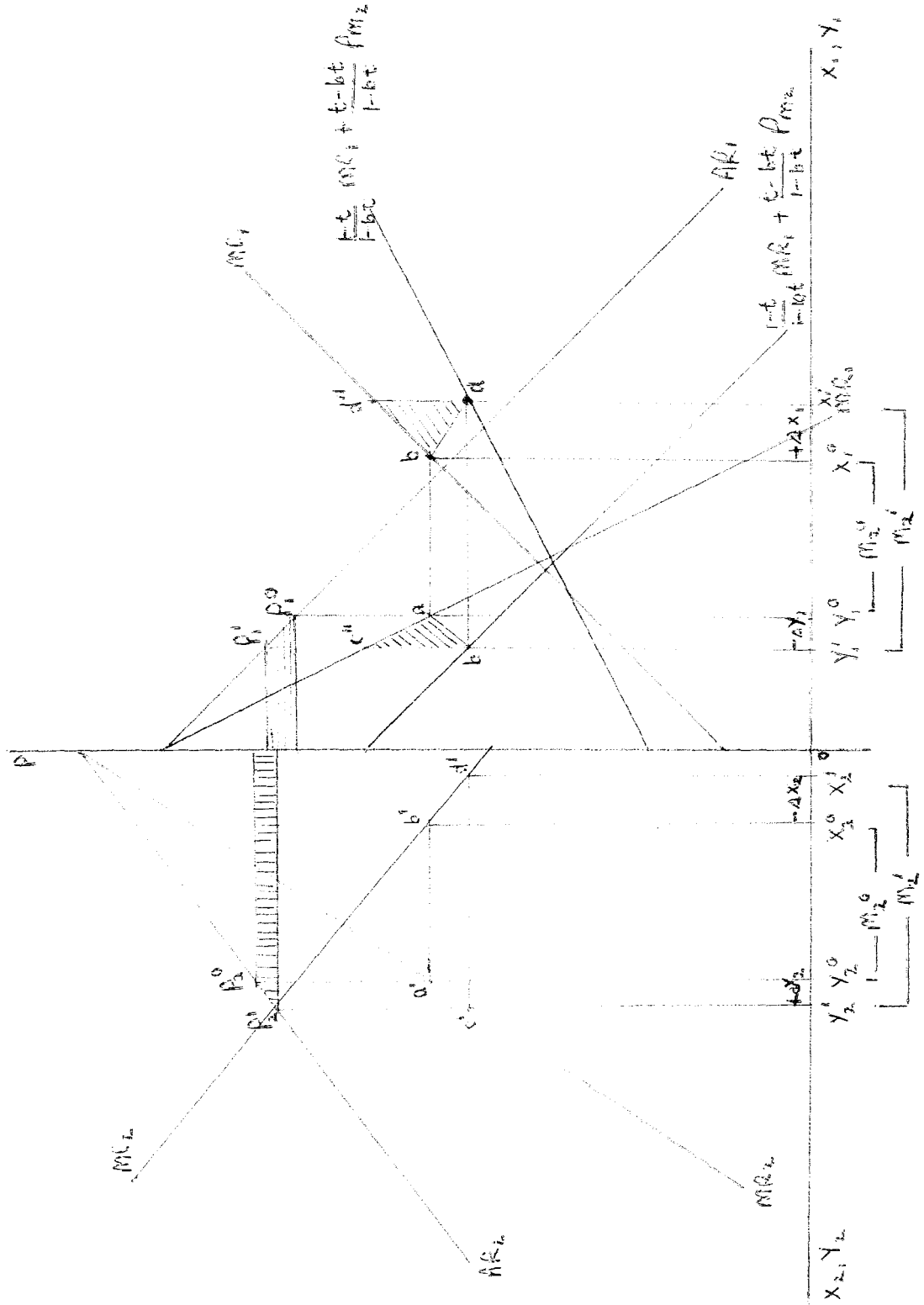
$MC_2$ over the fall in $X_2$, or $-b'd'\Delta X_2$. The rise in total cost is the area under the pretax $MC_1$ curve over the rise in $X_1$, or $bd''\Delta X_1$. Since $d''$ must lie above d (the $MC_1$ curve is upward sloping) there is a net rise in total costs represented by the triangle bdd''. Third the MNE has equated the marginal revenues of the two firms, and equated the marginal costs of the two firms. If at that level marginal revenue equals marginal cost no further changes are necessary and total output and sales are unchanged. This case is shown in Figure IV.7. If, however, marginal revenue exceeds marginal cost, a net expansion of output and sales is caused by bringing MR and MC into equality. This third procedure involves 1) a further expansion of $Y_2$, and therefore of total revenue; 2) a smaller decline in $Y_1$ and thus a smaller fall in total revenue, 3) a further rise in $X_1$ and therefore a larger rise in total cost, 4) a smaller fall in $X_2$ and a smaller fall in total cost. That is, when total sales and output expand both total revenue and total costs rise somewhat. Since the movements are in the same direction and of approximately the same magnitude the net effect of losses in excess of the tax is undisturbed. If bringing MR and MC into equality caused output and sales to decline total revenue and total sales would both have fallen somewhat.

Corporate tax revenues are maximized when total corporate profits are maximized. Total profits are at a maximum where marginal profit is zero, that is, where marginal revenue equals marginal cost. As we have seen, under free trade, total MNE profits are maximized when $MR_1 = MC_1 = MR_2 = MC_2$. Total taxes are therefore at a maximum only if this equality persists after the tax. This will occur in two situations only 1) if the MNE ignores the tax entirely, 2) if branch-residence rules apply so that the total tax incidence falls on the corporation. In these two cases

the pretax equality of marginal revenues and costs is not disturbed.
Under branch rules all profits of the MNE are taxed at the same rate - t
percent.  Therefore manipulating transfer prices has no effect on taxes
paid to government 1.  Total profits of the MNE fall by the tax.  Note
that none of the tax is shifted forward or backward as is possible in
cases where transfer pricing affects profits.  But no extra burdens of
declining revenues and increasing costs occur since no reallocations of
output and sales take place.

If, however, the MNE reacts to the tax by adjusting trade flows
the pretax equality of marginal revenues and costs is broken.  Figure IV.7
shows that the corporation equates

$$MR_2 = MC_2 = \frac{1-t}{1-bt}MR_1 + \frac{t-bt}{1-bt}Pm_2 = \frac{1-t}{1-bt}MC_1 + \frac{t-bt}{1-bt}Pm_2 .$$

That is, the corporation equates after tax revenues and costs (c' = d' =
c = d).  Pretax revenues and costs are not equal.  (c', d', c'', d'').
As a result marginal pretax profit is not zero and total pretax profits
are not maximized.  Therefore tax revenues are not maximized.  Tax revenues
are smaller than if the corporation had wholly absorbed the tax.  However,
it is obvious that the actual tax paid by the MNE plus the two extra
burdens of higher costs and lower revenues must, in total, be less than
the taxes that would have been levied had the MNE ignored the tax.  Other-
wise costs would have been minimized by absorbing the entire tax burden.

In summary, corporation profits fall by more than actual tax
costs due to the distortion of resource allocation.  However, these total
costs are less than the tax costs that the corporation would have paid
had the entire tax incidence fallen on the MNE.  The MNE is left therefore

with larger after-tax gains under source or subsidiary rules (where b < 1)
than under branch rules. In comparing the source and subsidiary results,
where government 1 taxes on the source rule the reallocations of output
and sales are larger than in the subsidiary case because the incentive to
transfer profits to firm 2 is stronger. Therefore the producer reallo-
cation costs are larger, ceteris paribus, under the source rule than under
residence-subsidiary rules but the tax costs are less.

Consumer Gains from Trade

The measure of consumer gains or losses from intrafirm trade
under the tax is shown by changes in consumer surpluses. These changes
will depend on the direction and size of trade flows and on the tax inci-
dence passed to consumers.

If trade expands (as is possible with a low fixed transfer price
or a variable price based on average cost) consumers of the exported good
suffer losses in consumer surplus as domestic sales contract. Consumers
of the importing product gain as domestic sales expand. The actual gains
and losses will depend on the demand elasticities, the initial sales and
consumer price levels and the final levels. If total corporate output
and sales expand as a result of the tax the consumer gains will be some-
what larger and the losses somewhat smaller. In Figure IV.7 consumers in
country 1 lose surplus shown as the horizontally striped area $(P_1^1 P_1^o ij)$
while consumers in country 2 gain surplus represented by the vertically
striped area $(P_2^o P_2^1 gh)$. The net effect on all consumers is ambiguous.

If intrafirm trade contracts, consumers in the exporting country
gain surplus as domestic sales expand while consumers of the imported
good lose surplus. Trade will likely contract if a high transfer price,
either fixed or based on average revenue is followed. If trade reverses

so that firm 2 becomes the exporter, domestic sales of $Y_2$ decline causing losses to consumers of $Y_2$ while sales of $Y_1$ expand causing gains to consumers. In general, then, if trade contracts or reverses, consumers of firm 1's output gain surplus while consumers of firm 2's output lose surplus.

Where government 1 taxes on the residence-branch principle no tax differential exists. As a result the entire tax incidence falls on the MNE and no changes in sales occur. Therefore there are no consumer gains or losses. Where source rules are followed the tax differential is larger compared to residence-subsidiary rules. As a result the changes in trade flows and sales will be larger and thus the gains or losses to consumers increased.

## Factor Gains from Trade

If factor markets are perfectly competitive factor prices are unaffected by the tax. The tax incidence cannot be shifted backward by the multinational. Changes in output between the two firms will, however, cause factor flows as the MNE attempts to shift the tax to consumers. If trade expands, more factors are hired by firm 1 while factors are released from firm 2. If trade contracts or reverses, firm 2 now hires more factors while firm 1 releases them. Total corporate output may expand or fall as a result of the tax and this will affect the total volume of factors hired by the multinational. If the multinational can affect factor prices, part of the tax incidence may be shifted to factor owners. Factors employed by the contracting firm may suffer falling factor incomes while those employed by the expanding firm realize higher factor prices and incomes.

## Government Gains from Trade

The fourth group, the government of country 1, unambiguously gains tax revenues of $btTT_2 + tTT_1$. The government's revenues are maximized if the foreign firm is a branch since in this case the MNE cannot shift the tax to consumers in the form of higher prices or to factors as low factor prices but absorbs the tax itself. Where the tax rate on firm 2 is lower the corporation can reduce its tax bill via transfer pricing and dividend repatriation manipulation. The lower the transfer price the more profits are shifted to the importer. The lower the repatriation rate the more taxes are deferred and reduced. Where the corporation is free to set its transfer prices and remitted profits are not taxed the corporation will be free to minimize tax costs. Regulation of transfer prices and remittance rates will increase tax revenues but at the expense of higher government administration costs. Unless branch rules apply, government revenues are not maximized since pretax profits are not maximized.

## The Distribution of Trade Gains Between Countries

## The Distribution of Producer Gains

The distribution of producer's gains between the two firms is also affected by the tax. Before the tax the division of gains was as follows:

firm 1's profits were $Y_1(P_1 - AC_1) + M_2(Pm_2 - AC_1)$;

firm 2's profits were $X_2(P_2 - AC_2) + M_2(P_2 - Pm_2)$; and

total MNE profits were $Y_1(P_1 - AC_1) + X_2(P_2 - AC_2) + M_2(P_2 - Pm_2)$.

What happens to these profits and their allocation depends on whether trade expands, contracts, ceases or reverses. The change in trade patterns

depends on the transfer price used, whether fixed or variable, high or low, and on the taxation principle used by government 1, whether source or residence, branch or subsidiary. Several cases are possible, each yielding different after tax profits and division of these profits. Only the trade expansion case will be considered here to avoid over-burdening the reader. Trade expansion occurs if a low transfer price, either fixed or based on average costs, is set by the corporation. High transfer prices are likely to cause trade contraction or reversal.

The trade expansion case is illustrated in Figure IV.1 for a fixed transfer price. As shown in Appendix IV.3 of this chapter after tax profits of firm 1 become $(1-t)[Y_1(P_1 - AC_1) + M_2(Pm_2 - AC_1)]$. Since $Y_1$ declines and $X_1$ rises, $P_1$ rises and $AC_1$ rises. In the linear case the rise in $P_1$ is offset by the rise in $AC_1$ so that per unit profits on domestic sales are unchanged although total profits decline. If the $AC_1$ curve increases faster than the $AR_1$ curve declines this drop in profits is accentuated. Profits on $Y_1$ therefore fall by more than the tax. Since $M_2$ rises while per unit trade profits decline the change in total trade profits before tax is ambiguous. Trade profits may fall by more or less than the tax.

After tax profits of firm 2 in Figure IV.7 are $(1-bt)[X_2(P_2 - AC_2) + M_2(P_2 - Pm_2)]$. Since $X_2$ declines as $Y_2$ rises, $AC_2$ falls as $AR_2$ falls. In the linear case the fall in $AR_2$ is offset by the fall in $AC_2$ so per unit profits on output are unchanged although total profits fall. If the slope of $AC_2$ increases with $X_2$ per unit profits may increase somewhat. Profits on output in general fall by more than the tax. Since imports increase while per unit trade profits decline the effect on pretax trade profits is uncertain. Trade profits may fall by more or less than the tax.

Total MNE after tax profits are $(1-t)Y_1(P_1 - AC_1) + (1-bt)X_2$ $(P_2 - AC_2) + M_2[(1-bt)P_2 - (1-t)AC_1 - (t-bt)Pm_2]$. Profits on $Y_1$ and on $X_2$ fall by more than the tax revenue paid on them. The transfer price affects total trade profits since the higher the transfer price the more tax paid to government 1. The goal of the corporation is to minimize its tax bill in order to maximize after tax profits. Since pretax profits are not maximized the actual taxes paid by the MNE are less than those under branch rules. Total profits, however, fall by more than actual tax costs due to the tax-induced distortion of sales and output allocation. The effect on total profits is therefore unambiguous while the division of after tax profits between the two firms is uncertain. (This result also applies in the tariff case--profits fall by more than the actual tariff costs but the division of profits is uncertain.)

Where government 1 taxes on the residence principle and firm 2 is a branch profits of the MNE fall by the tax. The allocation of after tax profits between the two firms is unaffected by the tax since it falls equally on all profits.

Where government 1 taxes on the source principle no taxes are levied on firm 2's profits. Changes in trade flows are accentuated as the MNE attempts to shift more profits to firm 2. In the trade expansion case the increase in trade flows would be larger, the fall in $Y_1$ and in $X_2$ also larger. Pretax profits on $Y_1$ and $X_2$ would therefore fall even more although profits on $M_2$ would increase. Since profits in firm 2 are not taxed at all profits would be higher in firm 2 and after tax profits in firm 1, lower.

## The Division of Consumer Gains

The division of consumer gains was previously outlined in the section on total consumer gains. While the total effect on consumers is uncertain the effect on each group is easily stated. If trade expands consumers in country 2 gain from increased sales of $Y_2$ while consumers in country 1 lose as sales of $Y_1$ decline. If trade contracts or reverses the division of gains is reversed as consumers of $Y_1$ gain while consumers of $Y_2$ suffer losses in consumer surplus. In a general equilibrium setting changes in consumer surpluses include the changes induced in other commodities as substitutes and complements for $Y_1$ and $Y_2$ and their effects on consumers.

## The Division of Factor Gains

In a perfectly competitive factor market neither group is affected by the tax since factor prices are unaffected. Factors are released from firm 2 and hired by firm 1 if trade expands, and vice versa if trade contracts or reverses. If factor prices are affected the intensive factor in the expanding firm gains absolutely and relatively compared to other factors. Factors employed by the contracting firm may suffer falling factor prices as the corporation shifts part of the tax incidence onto factor owners.

## Effects on National Income and the Balance of Payments

### Effects on National Income

The contribution of each firm to its country's domestic product is measured by the value added by that firm's domestic production. When a profits tax is levied under residence-branch rules total output and the allocation of that output is unchanged. Therefore the contribution of

each firm to that country's domestic income is unchanged. Contribution
to national income is determined by the residence of the factors employed
by the firm. Since the technology is owned by the parent firm resident
in country 1, the pure profits earned by the branch are part of the
national income of country 1. Since taxation of MNE profits under branch
rules does not disturb pretax profits and no changes in output occur, the
contribution of the MNE to the national income of either country is un-
changed.

Under residence-subsidiary or source rules, however, total
output and its allocation between the two firms will generally be different
after the tax is levied. As a result the value added by each firm will
be different. Since value added is usually measured before direct taxes
the value added by firm 1 is $P_1'Y_1' + Pm_2M_2'$ (if firm 1 remains the exporter
after the tax) and by firm 2 is $P_2'Y_2' - Pm_2M_2'$. If trade expands (assuming
a fixed transfer price) firm 1's export profits expand while domestic sales
revenue contracts (the firm operates in the elastic part of its demand
curve). Firm 2's domestic sales revenue rises while its import costs
also increase. The effects on the domestic income of each country are
therefore ambiguous. If trade contracts or reverses different effects on
domestic income will be observed.

National income includes the income of residents earned at home
plus that remitted from abroad. If factor prices are not affected by
the tax the national income of both countries is unaffected by changes
in factor flows in response to the tax. If the corporation can affect
factor prices the changes in national income arising from labor and capital
will depend on whether intrafirm trade expands, contracts or reverses. If
trade expands (so $X_1$ rises), more factors are employed by firm 1 at

generally higher prices and less by firm 2, causing their prices to probably decline. If output increases cause the incomes of factors resident in country 1 to rise the national income of country 1 arising from this source will increase. This may be offset by the increased outflow of factor earnings of factors resident in country 2 but employed in firm 1. The opposite occurs in firm 2.

A third factor affecting the national income of each country is the profits of each firm. Unrepatriated profit is included in country 2's national income (in the subsidiary case) while the home country includes remitted profits in its national income. If the parent firm pays the entire tax levied on the MNE without demanding extra profit remittances to cover the subsidiary's tax the contributions to national income of each firm are unchanged. If, however, the parent firm demands increased dividend remittances to cover the extra tax levied on the subsidiary the national income of country 2 declines by this increased outflow of profits. This is unlikely since increased dividend remittances will lead to greater taxes being levied on the corporation. The parent firm may, however, channel the necessary liquid assets through other forms that face lower tax rates (royalties, calling in loans, interest payments, for example).

## Effects on the Balance of Payments

The Balance of Payments between the two countries will be affected by changes in commodity flows, factor flows and profit flows. The tax may cause commodity volume flows to expand (if a low transfer price is set), to contract, to cease or reverse (if a high transfer price is set). The direction and size of the value of commodity flows may well differ from

that of the volume of flows if the tax causes the corporation to change
its transfer pricing policy. Factor flows will be larger, the greater
the tax differential between the two firms, the greater the resulting
changes in output, and the more influence the MNE has over factor prices
(since factor price differentials will also cause factor flows). The flow
of liquid assets from firm 2 to firm 1 is likely to be larger, the smaller
the tax differential and the more insistent the parent firm is on recoup-
ing the subsidiary's share of the tax burden in the form of remitted
dividends or dividend substitutes.

### Summary of the Gains from Trade Argument

The gains from trade and the division of these gains between
firms, consumers, producers and the government is predictable (but not
unambiguous) once we know two variables:
1) the tax differential between the two firms, and
2) the transfer pricing policy of the corporation.

Knowing these variables we can predict whether intrafirm trade
will expand, contract or reverse. The effects on each of the four groups
can be explained. The effects on national income and on the Balance of
Payments can be outlined. This procedure of determining the gains from
trade does not depend on the stated values of the taxes involved but on
their actual differential. In this chapter the tax differential was
always either positive or zero. In the next chapter we introduce taxation
by the host government. As a result the tax differential may be positive,
negative or zero. However, assuming any particular transfer price the gains
from trade can be outlined as in this section. For this reason, the
following chapters do not discuss the gains from trade.

## Conclusions

Maximization of tax revenues and maximization of corporate after-tax profits are conflicting goals. Governments can determine the principles under which corporations are taxed--residence-branch, residence-subsidiary, or source. They can allow tax deferrals or exemptions and determine the tax differentials between countries and between forms of business organization. The multinational corporation, on the other hand, can avoid taxes by altering transfer prices, shifting production facilities, changing dividend remittances, and affecting intrafirm trade flows. The scope of the MNE for tax avoidance is much larger than that of a national firm due to the multinational's freedom to use these tax avoidance practices. When the MNE does succeed in reducing its tax bill, taxpayer equity is not attained since the investor does not pay the same tax wherever he invests. Governments have attempted to reduce tax avoidance by requiring fair market value pricing, reducing tax differentials, removing incentives to foreign base companies, and encouraging high rates of profit repatriation.

In this model of pure profits taxation by the home government tax revenues are maximized only when the corporation maximizes pretax profits. That is, the MNE must ignore the tax differential or the differential must be zero as under branch rules. When a differential does exist there is an incentive to minimize taxes by altering trade flows, transfer prices and production locations. If the MNE, in maximizing after-tax profits, does alter trade flows tax revenues are no longer at a maximum since pretax profits are not maximized. The corporation suffers three costs as a result of the tax: 1) the actual taxes paid to the home government, 2) the extra cost of shifting output away from the pretax profit-maximizing allocation to a less efficient allocation, 3) the reduced

revenues of shifting sales away from the pretax profit maximization allocation to one generating smaller revenues. These three costs are, however, less than the tax costs in the branch case.

Since the tax applies to trade flows in both directions (in comparison with a tariff that only affects one-way flows) the tax differential may cause trade flows (in volume terms) to expand, contract or reverse as the tax alters the after tax marginal costs and revenues of the two firms. Where only the home country taxes profits, and b is less than one, firm 2 will face a lower tax rate than firm 1. This encourages trade expansion in order to shift profits to the lower-taxed firm. This incentive can be partially or wholly offset by the transfer price effect since the higher is $Pm_2$, the more profits are allocated to firm 1, the exporter, where they face a higher tax rate. Variable transfer prices add another complication. Transfer prices, such as $AR_1$ and $AC_1$ are trade reducing since as exports decline export prices fall. Prices such as $AR_2$ and $AC_2$, on the other hand, encourage expansion since the $Pm_2 - M_2$ relationship is negative. The net effect on trade flows will depend on the tax differential and the transfer pricing rules.

The effect of the tax on trade flows also determines the gains from trade after the tax. Four groups are affected by the tax: firms, consumers, factors and the government. Corporate profits fall by more than the taxes paid to the government if changes in trade flows occur as the MNE attempts to shift part of the tax incidence to consumers and to factors. National and domestic incomes and the Balance of Payments are also altered if the MNE responds to the tax by altering trade flows.

In summary, where tax differentials exist, conditions for tax neutrality are not satisfied. The multinational uses the differential

to minimize its tax burden. This causes changes in trade flows, in production allocations, in consumer prices and in factor flows. The residence-branch principle with no tax deferments or exemptions is the only neutral tax; neutral in the sense that it does not distort the pre-tax profit-maximization position of the multinational. It is also the rule that maximizes tax revenues for the host government. However, an efficient, neutral tax may not be an equitable tax. Considerations such as the desire to encourage foreign investment in less-developed countries may outweigh the desire for tax neutrality. In the next chapter we examine tax efficiency and equity criteria when both home and host governments tax multinational profits.

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disturbed. Only under full profit repatriation is the division of national gains unaffected since, in this case, the tax is simply a transfer of profits within the same country (from the MNE, resident in country 1, to the government of country 1). In the other cases part of the tax may represent consumer surplus or factor income losses in the host country. In Musgrave's terms, if the tax is not shifted only 'interindividual equity' is affected. If the tax is shifted 'inter-nation equity' can be distorted.[1]

Inter-nation equity, or the equity of the division of trade gains between nations, is also affected if the host country taxes multinational profits. When government 2 levies a pure profits tax on firm 2 it is redistributing intrafirm trade gains from the MNE to itself and therefore, indirectly from country 1 to country 2. If the MNE shifts the tax, the host country taxes can cause consumer and factor losses in the home country in addition to producer losses. Under both source and residence principles government 2 is only entitled to tax the local firm's profits and not those of the parent firm. However, the MNE as a whole is affected and will take steps to avoid this extra tax. Where tax rates differ the corporation will seek to minimize its tax burden by altering transfer prices and repatriation rates so as to declare and retain more profits in the low tax jurisdiction.

In this chapter we examine whether taxation by both governments is neutral and how interindividual and inter-nation equity are affected. When both governments levy taxes on the multinational enterprise double taxation of profits can occur. We consider the three cases of 1) taxation

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1. This chapter relies heavily on the efficiency and equity concepts of international taxation as developed by R. A. Musgrave and P. B. Musgrave in "Inter-nation Equity," published in Modern Fiscal Issues; Essays in Honor of Carl S. Shoup, edited by R. M. Bird and J. H. Head, 1972.

by country of source of income, 2) taxation by the residence country when the foreign firm is a branch, and 3) taxation by the residence country when the foreign firm is a subsidiary.

When both governments tax on the source principle taxation is restricted to taxation of income earned within the borders of each country. Double taxation of profits does not occur as government 1 taxes firm 1's profits and government 2 taxes firm 2's profits. However, when the home government taxes on the residence principle frim 2's profits are taxable by country 1 and therefore double taxation of $TT_2$ can occur. If firm 2 is a branch of the MNE firm 2's total profits are taxed twice, once at rate $t_2$, the host government's tax rate, and once at $t_1$, the home government's tax rate. In the absence of deductibility of, or a credit for, tax paid to country 2, in computing the tax due to country 1, the total tax paid by firm 2 is $(t_1 + t_2)TT_2$. This double taxation is less when firm 2 is a subsidiary since only repatriated profits of $bTT_2$ are taxable by country 1 at $t_1$ percent. Total tax paid by firm 2 in this case is $(t_2 + bt_1)TT_2$.

Double taxation of business income is regarded as inequitable and nonneutral. It is inequitable in that the home capitalist who invests abroad pays more tax than a home capitalist who invests at home. It is inefficient in that capital will not be so allocated that the pretax rate of profit is everywhere the same. For these reasons current tax practice is for the home country to modify its own taxation so as to prevent the double taxation of foreign income of its residents. There are two basic modifications available depending on whether the home government holds a 'national' or 'international' view of interindividual equity and efficiency.

Under the national point of view equity requires that all tax-payers receive equal treatment. Foreign taxpayers should deduct foreign taxes as an expense of doing business abroad in calculating domestic tax. From a national efficiency viewpoint foreign investment should be carried to the point where the after tax return on foreign investment equals the pretax return on domestic investment. This is ensured where foreign taxes are deductible as a business expense.

Under the international interindividual equity point of view total taxes paid by the MNE to both governments should be the same as if all profits had been earned in the home country; that is, the home government should set the upper limit of tax on firm 2. This is accomplished when the home government credits the MNE for the foreign tax paid in calculating domestic taxes. International efficiency is also satisfied by crediting since it ensures that the investor pays the same tax where-ever he invests. But if country 2's tax rate is higher, full neutrality is not achieved since, in actual practice, the home government seldom gives a refund.

So there are basically three possibilities to be examined in this chapter:

1. Both countries tax under the source principle and double taxation problems do not arise (assuming true domestic profits are known).

2. Country 2 taxes under the residence principle from a national view-point and therefore deducts foreign tax in calculating profits subject to domestic taxes.

3. Country 1 taxes on the residence principle from an international viewpoint and therefore credits foreign taxes in calculating domestic taxes, at least up to the country 1 tax credit.

Principles of Taxation

This section outlines the three tax principle possibilities stated above in terms of our previous model--two monopolistic related firms engaged in selling in their local markets and in intrafirm trade for the purpose of maximizing total corporate profits.

## Taxation by the Source Country

Where both governments apply source rules taxation is restricted to income earned within the borders that is directly connected with either a permanent establishment or a business incorporated in that country. All income from domestic sources is subject to domestic tax. Therefore taxes levied on firm 2 are $t_2 TT_2$, and on firm 1, $t_1 TT_1$. Total aftertax profits of the MNE are $(1-t_1)TT_1 + (1-t_2)TT_2$. [2]

## Taxation by Residence Country with Deduction of Foreign Taxes Permitted

Government 2 first taxes firm 2's profits at the domestic rate of tax. After tax profits of firm 2 are $(1-t_2)TT_2$. b percent of these after tax profits are remitted to firm 1--that is, $b(1-t_2)TT_2$ is received by firm 1 and included in its income.

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2. Until 1976 Canada will permit foreign dividends to be remitted untaxed. The Tax and Trade Guide: Canada, 3rd edition, August, 1973 states in section 6.157 on page 121 that "Dividends paid by a foreign affiliate, before its 1976 taxation year, out of business income will be exempt to the receiving Canadian corporation. Thereafter, dividends will be taxable to the extent they exceed the aggregate of twice the foreign withholding tax on the dividend and the amount of foreign tax applicable to the income out of which the dividend was paid." In other words, after 1975, the Canadian government will move to a credit system in taxing the dividends of foreign subsidiaries with Canadian parents. Canada is thus in the process of moving from source rules to a residence-subsidiary rule.

Since foreign taxes are deductible as an expense, total income stated by firm 1 is therefore $TT_1 + b(1-t_2)TT_2$. Tax paid on this income is $t_1[TT_1 + b(1-t_2)TT_2] = t_1 TT_1 + bt_1(1-t_2)TT_2$. Total tax paid by the MNE is $t_1 TT_1 + (t_2 + bt_1 - bt_1 t_2)TT_2$. After tax profits of the MNE are therefore: $(1-t_1)TT_1 + (1-t_2-bt_1 + bt_1 t_2)TT_2$. That is, taxation of firm 1's profits is unchanged by the movement from source to residence-deduction rules but firm 2's profits are affected. Firm 2's taxes still include taxes levied by government 2 of $t_2 TT_2$ but an extra tax of $bt_1 TT_2$ is levied by government 1. The effective deduction of tax relief received by the MNE is $-bt_1 t_2 TT_2$ which is less than the extra tax levied by government 1. The net tax change in a move from source to residence-deduction is an increase in tax of $bt_1(-t_2)TT_2$. If no foreign profits are taxes (source rule) the residence-deduction rule is exactly the same as the standard source rule since after tax MNE profits become $(1-t_1)TT_1 + (1-t_2)TT_2$. The source rule is therefore contained within the second rule for the case of zero repatriation. Where firm 2 is a branch (b = 1) after tax profits of the MNE become $(1-t_1)TT_1 + (1-t_2-t_1 + t_1 t_2)TT_2$. The extra tax levied on the MNE in the move from straight source rule to residence-deduction rule in this case is an extra tax of $t_1(1-t_2)TT_2$. This extra tax is larger where firm 2 is a branch than where firm 2 is a subsidiary since all profits of firm 2 are subject to tax by country 1 in the branch situation.

## Taxation by Residence Country with Credit Given for Foreign Taxes

There are two basic types of credit. In theory credit for foreign taxes implies that the corporation grosses up its taxable foreign income by the relevant foreign taxes and then credits these taxes against

the domestic tax. Some countries, notably the United States, grant a special form of credit, the LDC credit, to certain firms engaged in business in less developed countries. Under this form of credit foreign income is not grossed up by the foreign taxes for purposes of domestic tax. Let us therefore consider these two forms of tax relief separately.

Under regular credit procedure the parent firm must include in its total income remitted profits from firm 2 grossed up by the appropriate tax. That is, the tax levied on firm 1 is $t_1[TT_1 + b(1-t_2)TT_2 + bt_2TT_2]$ or $t_1TT_1 + bt_1TT_2$. Where firm 2 is a branch the appropriate tax is $t_2TT_2$. Against this tax may be credited the foreign taxes attributable to the foreign profits taxable in country 1, or the tax credit is $bt_2TT_2$. Net tax payable to government 1 is $t_1TT_1 + b(t_1-t_2)TT_2$. Where the foreign country's tax rate on corporate profits exceeds or equals the parent's tax rate no extra tax is payable on foreign income. Under current practice some countries determine the allowable tax credit on a 'per country' basis so that if the tax credit is exceeded no refunds are given and the extra credits are lost. Some countries allow credits to be carried either forward or backward against income so that the extra credits can be used against other income. Other countries follow the 'overall' credit limitation system where the parent can pool the foreign income from all of its branches and subsidiaries in calculating the domestic tax.[3] In this manner excess credits from foreign income where foreign rates exceed domestic tax rates can be applied against the income of branches or subsidiaries where foreign tax rates are lower.

3. The United Kingdom permits only the per country tax credit limitation while the United States allows either per country or overall limitation on dividends. The U.S. also allows excess credits to be carried forward five years or back two years.

This chapter examines in detail the tax credit system under the per country limitation where excess credits are not usable. Comments on the overall limitation are, however, included.

Under regular credit the after tax profits of the multinational are $(1-t_1)TT_1 + (1-t_2-bt_1 + bt_2)TT_2$ when residence rules apply. When country 1 taxes on the basis of the source principle the corporation's after tax profits are $(1-t_1)TT_1 + (1-t_2)TT_2$. If firm 2 has the higher tax rate and refunds are not available, the after tax profits of the MNE are the same under both rules.

In shifting from deduction to credit form of tax relief firm 1's domestic after tax profits are not affected. Foreign after tax profits, however, are affected. The extra tax due under deduction rules is $b(t_1-t_1t_2)TT_2$ compared to $b(t_1-t_2)TT_2$ under the credit method. Even when firm 2's tax rate is higher than firm 1's extra tax is due under deduction rules although none is due under the credit. By shifting from deduction to credit the corporation saves taxes of $bt_2(1-t_1)TT_2$.

Under LDC rules the corporation includes in its income remitted profits of $b(1-t_2)TT_2$.[4] These are not grossed up in calculating the domestic tax. The tax is therefore $t_1[TT_1 + b(1-t_2)TT_2]$. Against this may be credited what one may call the 'ungrossed up foreign tax' attributable to the taxable foreign taxes. That is, the tax credit is $bt_2(1-t_2)TT_2$ as compared to a regular tax credit of $bt_2TT_2$. Total tax payable by the corporation is therefore $t_1TT_1 + [b(1-t_2)(t_1-t_2) + t_2]TT_2$ leaving after tax profits of $(1-t_1)TT_1 + [1-t_2-b(1-t_2)(t_1-t_2)]TT_2$. This can be compared to after tax profits under regular credit procedures of $(1-t_1)TT_1 + [1-t_2-b(t_1-t_2)]TT_2$. Under both regular and LDC credit no extra tax is

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4. For specific notes on the LDC credit regulations in effect in the United States see the <u>Prentice Hall Tax Guide, Federal Tax Course, 1975</u>, pp. 307-8.

payable where the foreign tax rate of $t_2$ percent equals or exceeds the domestic rate of $t_1$ percent. Where the home country has the higher rate the LDC credit provides more tax relief than the regular credit. In fact under certain circumstances taxes may be minimized if the host country selects a tax rate in proportion to the home country's rate. The total tax levied on the MNE is $t_1 TT_1 + [b(t_1 - t_1 t_2 - t_2 + t_2^2) + t_2]TT_2$. To minimize the total (foreign and domestic) tax we differentiate this expression with respect to $t_2$ and, setting the result equal to zero, determine a stationary value for the expression. This is $(1-b-bt_1 + 2bt_2)TT_2 = 0$ which reduces to $t_2 = 1/2[1 + t_1 - 1/b]$. If full profit remittance occurs this reduces to $t_2 = 1/2t_1$; that is, under residence-branch rules or if all subsidiary profits are fully repatriated, taxes are minimized if the foreign tax rate is one-half of the domestic rate. This result has been previously proven by Carl Shoup.[5]

## Profit Maximization When Both Countries Tax Pure Profits

### Assumptions

Where both countries claim the right to tax the net income of the international corporation the problem of double taxation can occur. How can the MNE avoid paying taxes on the same base to more than one country? The right to levy taxes is a right of national sovereignty but the multinational also has the right to be free from excessive taxation.

This section examines in detail the problem of double taxation and the types of tax relief most commonly offerred by the home country.

5. Carl S. Shoup, "Taxation of Multinational Corporations" in The Impact of Multinational Corporations on Development and on International Relations; Technical Papers: Taxation, United Nations, 1974, pages 39-42.

The first factor to consider in examining the tax effects on the MNE is the tax principle followed by each government. There are three possibilities. First, both countries tax only on the source principle and no double taxation occurs. Tax rates may differ, however, between the two countries causing changes in trade flows. Second, government 1 taxes on the residence principle where firm 2 is a branch. In this case the world-wide income of the MNE is taxed as earned. Tax relief may or may not be permitted by government 1 in calculating the taxes due on the branch income. Third, government 1 taxes on the residence principle where firm 2 is a wholly-owned subsidiary of the MNE. In this case tax deferral is normally permitted[6] until the profits of the affiliate are remitted to the parent. Tax relief may or may not be granted.

The second factor to consider is the form of tax relief usually given by the home government for taxes paid to foreign governments on the income or property of foreign affiliates or branches of domestic enterprises. Relief is given in recognition that in the absence of relief domestic investors investing at home pay less income taxes than domestic investors investing abroad who pay both foreign and domestic taxes.[7] This section examines four possible types of tax relief, symbolized by the variable $c$:

1. $c = 0$. That is, no tax deduction or credit is allowed by the home

6. Tax deferral is not permitted in the United States under Subpart F for nonmanfacturing income, income from services performed for related persons outside the nation, and income from sale of property to related persons outside the nation. In Canada the Tax and Trade Guide: Canada, op cit., states in section 6.158 page 121, that "Beginning in 1975, if a foreign affiliate earns any foreign property accrual income (income other than from an active business and including net taxable capital gains), it will be deemed included in the Canadian company's income but only to the extent that it exceeds twice the amount of foreign tax applicable to the income."

7. This is Musgrave and Musgrave's, op cit., definition of inter-individual equity.

government in calculating the domestic taxes due on foreign income of domestic firms. Part or all of the tax base of the foreign firm therefore will be taxed twice, depending on whether the firm is a subsidiary or a branch.

2. $c = bt_1t_2$. Foreign taxes are allowed as a deduction against income in determining domestic tax payable on the foreign income.

3. $c = bt_2$. Foreign taxes are creditable up to the home country's tax rate. Under the per country limitation excess credits may not be used against other income up to the credit limit. This section assumes the per country limitation is followed so that refunds are not given where the foreign tax rate exceeds the home rate.

4. $c = bt_1t_2 + bt_2(1-t_2)$. The foreign firm is a LDC enterprise and a special credit is given. Foreign taxes are creditable against ungrossed up income. The credit may be considered as a deduction and partial credit combined.

Where $t_1$ exceeds $t_2$ the LDC credit gives the greatest tax relief. Where $t_2$ exceeds $t_1$ and no refund is given by the home government regular and LDC credit provide the same (and the largest) tax relief. If tax refunds were available regular credit would provide the greatest form of tax relief.

The final factor to consider in examining the effects of taxation by both countries is the transfer price since, by affecting the allocation of trade profits between the two firms, the transfer price also affects the taxation levied on each firm and the total tax bill of the MNE. By manipulating transfer prices the corporation can shift profits from a high tax jurisdiction to a low tax jurisdiction, thus avoiding tax.

Therefore the factors influencing trade flows are: the tax rates in each country ($t_1$ and $t_2$), the taxation principle followed as symbolized by the variable 'b', the type of tax relief offerred by the home government ('c'), and the transfer price. In the following sections the discussion proceeds under the topic, 'the transfer price,' and the subtopic, 'type of credit,' with 'rate of repatriation' and 'tax rates' as sub-sub topics. In this manner one can see, for any particular transfer price, the effect of changing from one method of tax relief to another. The outline could have been arranged in other fashions, such as by type of credit, but this method facilitates comparisons between methods of tax relief--a prime interest of the chapter.

## Profit Maximization with a Fixed Transfer Price

Introduction

As shown in Appendix V.2 the profit maximizing condition for the corporation under a fixed transfer price is:

$$\frac{1-t_1}{1-t_2-bt_1+c}MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1tc}Pm_2 = \frac{1-t_1}{1-t_2-bt_1+c}MC_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}Pm_2 = MR_2 = MC_2$$

Firm 1 pays $t_1TT_1$ in domestic tax; firm 2 pays $t_2TT_2$ in domestic tax and when profits of $b(1-t_2)TT_2$ are remitted (for legal purposes) to firm 1 an extra tax of $(bt_1-c)TT_2$ must be paid to government 1. The taxes may be considered to have two effects on the corporation--the ad valorem effects and the specific effects.

The ad valorem effects cause the marginal revenue and cost curves of firm 1 to shift either up or down to some fraction of their original values. This fraction, $(1-t_1)/(1-t_2-bt_1+c)$, represents the

ratio of the after tax rate of return in firm 1 to the after tax rate of

return in firm 2. Where firm 1 has the higher after tax return (i.e.

lower tax rate) the marginal revenue and cost curves shift upwards.

The effect is similar to subsidizing domestic sales of $Y_1$ and to taxing

output of $X_1$. Where firm 1 is originally the exporter[8] the ad valorem

effects thus work to contract trade. Where firm 2 has the higher after

tax return (i.e. the lower tax rate) $MR_1$ and $MC_1$ curves shift downwards.

The effects are now to tax domestic sales and subsidize output, so that

trade expands. The logic behind this is quite simple. Through trade

the multinational can shift profits from one firm to another. Where

firm 1 has the lower tax rate and is the exporter the general effect,

ignoring transfer pricing, is to contract trade. Trade contraction shifts

some profits from firm 2 to firm 1 where profits are taxed at a lower

tax rate. Where firm 2 has the lower tax rate the ad valorem effects

work to expand trade in order to shift profits to the importer.

The second factor, the specific effects, is related to the

transfer price. The higher the transfer price, the more profits are

allocated to the exporting firm and the less to the importer. Whether

this is advantageous or not to the corporation depends on the tax

differential between the two firms. This variable, $(t_1-t_2-bt_1+c)/$

$(1-t_2-bt_1+c)$, measures the net tax differential divided by the after

tax rate of return to firm 2. Where firm 1 has the higher tax rate the

specific effects are positive, shifting $MR_1$ and $MC_1$ up by a constant

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8. This chapter is based on the assumption that the parent firm is the
   exporter. If we assume that $Pm_1 = Pm_2$, however, the profit maximizing
   conditions are not changed. The results can be easily reinterpreted
   by substituting $Pm_1$ for $Pm_2$ and revaluating the effects. This is
   left to the reader due to space limitations, and to avoid needless
   repetition. If $Pm_1$ does not equal $Pm_2$ there will be secondary trade
   effects if a trade reversal occurs.

amount at all levels. This has the result of expanding domestic sales and contracting output so that trade contracts. Where firm 2 has the higher tax rate the specific effects are negative and trade expands. The reasoning is straightforward. If firm 1 has the higher rate, the larger the transfer price, the more profits are allocated to the high tax firm and the less to the low tax firm. Trade therefore contracts as the MNE attempts to minimize costs. If the importer has the higher rate, a high transfer price shifts profits to the exporter and trade therefore expands in order to maximize after tax profits.

We can explain this in another fashion. The multinational maximizes profits in the pre-trade-barrier situation by equating $MR_1 = MC_1 = MR_2 = MC_2$. That is, by setting $MR_1 - MC_1 = MR_2 - MC_2 = 0$ or marginal profit on domestic sales in each firm (the difference between marginal revenue and marginal cost) equal to zero. (Zero marginal profit implies maximum total profits while nonzero marginal profit implies nonmaximum total profits.) The transfer price does not affect total profits in this case since it is an internal price. The marginal profit on export sales by firm 1 would be the marginal revenue from exports minus their marginal cost. Since under fixed transfer pricing the export price does not vary with export sales $Pm_2$ is the marginal revenue from exports while $MC_1$ is the appropriate marginal cost. Marginal export profits are therefore $Pm_2 - MC_1$ for firm 1 and $MR_2 - Pm_2$ for firm 2. (Note that since $MC_1 = MR_2$ under free trade where firm 1 declares marginal export profits firm 2 declares marginal losses so that the marginal profit or loss to the corporation as a whole on intrafirm trade is zero as it is for domestic sales.)

This changes when taxes on pure profits are introduced. With taxation the marginal profit on exports can affect the choice between selling domestically or selling abroad. The corporation now equates $[MR_2 - MC_2] = \dfrac{1-t_1}{1-t_2-bt_1+c}[MR_1 - MC_1] = 0$. That is, if no changes in output or sales occur the marginal profit on domestic sales remains zero and thus the tax charged on this marginal profit is also zero. (Call this the marginal tax. Where the marginal tax is zero, total taxes are at a maximum.) The tax charged on marginal export profits of the MNE is

$$\dfrac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[Pm_2 - MC_1].$$ The result differs depending on which firm

has the higher tax rate and whether the transfer price is 'high' (ie. greater than $MC_1$), 'low' (less than $MC_1$) or an 'equilibrium' price (equal to $MC_1$). Note that '$MC_1$' refers not to the $MC_1$ curve as a whole but to the specific value of $MC_1$ as defined by the volume of output of $X_1$ in the pretax situation.

If firm 1 has the higher tax rate the tax differential is positive. The corporation therefore attempts to shift export profits from firm 1 to firm 2 where they are taxed at a lower rate. The goal of the MNE is thus to reduce export profits declared by firm 1 while increasing those allocated to firm 2. Also the corporation attempts to minimize the taxes paid on domestic sales of $Y_1$. A high transfer price implies that marginal export profit (and thus the marginal export tax) declared by firm 1 is positive while the marginal domestic profit on sales of $Y_1$ (and thus the marginal domestic tax) is zero. That is, pretax total domestic profits and the taxes paid on the profits are at

a maximum while pretax total export profits of firm 1 and the taxes

paid on these profits are not maximized. The corporation therefore

has an incentive to alter output and sales so as to reduce its taxes.

The MNE equates the after-tax marginal revenues and marginal costs in

determining the new trade volume and output and sales allocations. As

a result pretax marginal revenues and costs are no longer equal. (See

Figure IV.7 in the previous chapter.) By raising sales of $Y_1$ and reducing

output of $X_1$ so that trade contracts the pretax marginal export profit

and marginal export tax are increased. As a result total export profits

and total export taxes allocated to firm 1 decline. Since pretax $MR_1$

and $MC_1$ are now no longer equal total domestic profits and total domestic

profits of firm 1 also contract. In summary, a high transfer price

with a positive tax differential causes trade contraction as the MNE

attempts to reduce its taxes.

With a low transfer price and a positive tax differential marginal

export profit and marginal export tax are negative. By expanding trade

through increased output of $X_1$ and reduced sales of $Y_1$ marginal export

profit and the marginal tax are further reduced so that total export

profits and total export taxes of firm 1 decline. Since the corporation

equates after-tax marginal revenues and marginal costs pretax marginal

domestic profits are no longer zero and total domestic profits and total

domestic taxes of firm 1 also decline. Therefore, by expanding trade

taxes are reduced on both export and domestic sales.

If firm 2 has the higher tax rate and a high transfer price is

used the behavior of the corporation alters. The tax differential is

now negative so that the MNE attempts to shift export profits from firm 2

to firm 1, the low tax firm. The goal is thus to increase the export

profits (and the export taxes) of firm 1 while also reducing the domestic profits (and domestic taxes) on sales of $Y_1$. A high transfer price implies positive marginal export profits and a negative marginal export tax. Marginal domestic profit and marginal domestic tax are zero. Pretax total export profits and total export taxes are not maximized while pretax total domestic profits and total domestic taxes are at a maximum. By expanding trade marginal export profit declines while marginal export tax becomes less negative. As a result total export profit declared by firm 1 and its total export tax increase. With the change in output and sales patterns pretax marginal revenues and marginal costs are no longer equal so that pretax total domestic profits and total domestic taxes decline. By expanding trade taxes on $M_2$ paid by firm 1 increase while taxes on $Y_1$ decline.

If a low transfer price is coupled with a negative tax differential marginal export profit is negative while marginal export tax is positive. By contracting trade marginal export profit becomes less negative while marginal export tax declines. As a result total export profits and total export taxes allocated to firm 1 increase. Similarly the change in trade flows causes total domestic profits and domestic taxes to decline. The goal of the corporation is therefore achieved through trade contraction.

If an equilibrium transfer price is chosen, that is, the level of marginal cost under free trade, the sign of the tax differential does not affect the results or the behavior of the corporation. Setting $Pm_2$ equal to the marginal cost of producing $X_1$ in the pre-trade-barrier situation implies that both marginal export profits and marginal domestic sales profits are zero and thus the tax charged on marginal profits is

also zero. Since marginal profits are not affected by the tax the behaviour of the MNE does not change. Total pretax profits are at a maximum and thus the total tax bill is also at a maximum. The incidence of the tax falls wholly on the corporation. This result is therefore exactly identical to the case where both tax rates are the same (ie. where $b = 1$ under credit rules). It, however, has the advantage of guaranteeing maximum tax revenue without the problems of tax coordination involved in making $t_1 = t_2 + bt_1 - c$. As we shall see later this is only true for the fixed $Pm_2$ case--it does not hold where transfer prices are variable. Any $Pm_2$ higher or lower than $MC_1$ in the fixed $Pm_2$ case will cause changes in output and sales as the MNE minimizes taxes by shifting part of the tax incidence to consumers or factors.

In summary, where the high tax firm is firm 1 the ad valorem effects are trade expanding while the specific effects are trade contracting. Through trade the MNE can shift profits to the lower taxed importer but this can be offset by a high transfer price since a high price allocates larger profits to firm 1. Where the high tax firm is firm 2, the ad valorem effects are trade contracting while the specific effects are trade expanding. Where the tax rates are equal both the ad valorem effects and the specific effects are zero since shifting profits has no effect on the total tax bill. The crucial factor in determining the size of the shifts in the $MR_1$ and $MC_1$ curves, for any transfer price, is therefore the relative tax differential between the two firms. Note that the differential does not refer to the stated tax rates on profits in each country ($t_1$ and $t_2$) but to the total tax rate on the foreign firm as compared to the domestic firm ($t_2 + bt_1 - c$ compared to $t_1$). Let us now examine the effects of changing the value of the tax credit for particular stated tax rates and rates of repatriation.

## No Tax Relief is Given by the Home Country

Where no credit or deduction is given that part of firm 2's profits taxable in country 1 is taxed twice. Under source rules each country taxes only domestic corporate income and therefore no double taxation occurs. Under the residence-branch rules all of firm 2's income is taxed twice, once at $t_2$ percent and again at $t_1$ percent. Under residence-subsidiary rules remitted profits are double taxed. The effects on trade depend on a comparison between $t_1$ and $t_2 + bt_1$.

Where $t_1$ is less than $t_2 + bt_1$ the ad valorem effects are trade contracting while the specific effects are trade expanding. The net effect on trade depends on how high the transfer price is set relative to $MR_1$ and $MC_1$. Firm 2's tax rate will be higher than firm 1's in these cases: where $t_1$ equals $t_2$ and government 1 taxes on the residence principle (ie. $b > 0$); where $t_1$ exceeds $t_2$ and the residence-branch rule applies; where $t_2$ exceeds $t_1$ for all values of b.

Where $t_1$ exceeds $t_2 + bt_1$ the ad valorem effects are trade expanding while the specific effects are trade contracting. Firm 1's tax rate will be higher if $t_1$ exceeds $t_2$ and both countries follow source rules.

The tax rates are equal for the two firms if $t_1$ equals $t_2$ and source rules apply. In this case the MNE cannot shift profits to reduce the tax burden. The enterprise is in the same position as a domestic monopoly faced with a tax on pure profits. The incidence of the tax falls wholly on the monopolist and no changes in output or sales occur. The tax rates on the two firms are also equal where b equals $(t_1 - t_2)/t_1$; that is, where the rate of repatriation equals the tax differential divided by the home tax rate, and $t_1$ exceeds $t_2$.

Note that where $t_1$ exceeds $t_2$ under zero repatriation, firm 1 is the high tax firm; while under full repatriation, firm 2 becomes the high tax firm. In the residence-subsidiary case the actual rate of repatriation determines which firm has the higher tax rate. Without knowing whether b exceeds, equals, or is less than $(t_1 - t_2)/t_1$ we cannot predict the trade effects.

These results may be summarized as in the table below.

Table V.1

Trade Effects of a Fixed $Pm_2$ with No Tax Relief Given

| Rate of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | specific | ad valorem | specific | ad valorem | specific |
| b = 0 | no change | no change | expands | contracts | contracts | expands |
| 0 < b < 1 | contracts | expands | ambiguous | ambiguous | contracts | expands |
| b = 1 | contracts | expands | contracts | expands | contracts | expands |

## The Home Country Permits Deduction of the Foreign Tax

Under the deduction rule government 1 permits the MNE to deduct the appropriate amount of foreign income tax from its income in computing the taxes owed to the home government. Where both countries tax on the source rule the home government does not tax foreign income and therefore tax deduction has no relevance. Under the residence-branch rule all of the branch income is subject to tax in the home country and thus the appropriate tax to be subtracted is the total foreign tax. Under the residence-subsidiary rule only that part of the foreign tax attributable to remitted earnings of the subsidiary is allowable as a tax deduction.

In terms of symbols firm 1 pays home tax of $t_1 TT_1$ and firm 2 pays home tax of $t_2 TT_2$. Government 1 taxes $t_1$ percent of after tax profits of the foreign firm, or $b(1 - t_2)TT_2$, where the value of b determines which tax principle is followed by the home government. The extra tax levied on foreign income is therefore $(bt_1 - bt_1 t_2)TT_2$. Under residence rules and tax rates of less than 100% some double taxation of foreign income must always occur. The deduction rule therefore lessens the degree of double taxation placed on the firm because of overlapping tax jurisdictions if no credit or deduction is allowed, but does not remove it. One would expect that the effects on trade flows would be similar under deduction and no deduction rules since both involve some degree of double taxation of firm 2's income. Since under no deduction the extra tax is $bt_1 TT_2$ whereas under deduction it is $(bt_1 - bt_1 t_2)TT_2$ the changes induced in trade flows should be less under deduction rules. These a priori hypotheses are confirmed by the model.

Firm 1's tax rate is $t_1$ percent; the total tax rate levied on firm 2 is $t_2 + bt_1 - bt_1 t_2$ percent. The effects on trade depend on the relative tax differential between the two firms. The ad valorem effects cause the $MR_1$ and $MC_1$ curves to shift up or down to $(1 - t_1)/(1 - t_2 - bt_1 + bt_1 t_2)$ $MR_1$ and $MC_1$. This fraction measures the after tax return to firm 1 divided by the after tax return to firm 2. The specific effects cause $MR_1$ and $MC_1$ to shift by $[(t_1 - t_2 - bt_1 + bt_1 t_2)/(1 - t_2 - bt_1 + bt_1 t_2)]Pm_2$ which measures the transfer price weighted by the net tax differential divided by firm 2's after tax rate of return. The higher the transfer price the stronger the specific effects. The direction of trade effects thus depends on which firm has the higher tax rate.

Firm 1 has the higher rate in the following situations: where $t_1$ exceeds $t_2$ in the source case, and where $t_1$ exceeds $t_2$ and the rate of repatriation (for tax purposes) is less than $(t_1 - t_2)/(t_1 - t_1 t_2)$. If firm 1 is the high tax firm the ad valorem effects are trade creating since through trade the MNE can shift profits to the importer. The specific effects are trade diverting since the higher the transfer price the larger the per unit profits declared by the exporter, firm 1.

Firm 2 has the higher tax rate in the following situations: under residence rules where $t_1$ equals $t_2$; where $t_2$ exceeds $t_1$ for all values of b; under residence rules where $t_1$ exceeds $t_2$ and the rate of repatriation is greater than $(t_1 - t_2)/(t_1 - t_1 t_2)$. In these cases the ad valorem effects are trade contracting since trade would shift profits to the high tax jurisdiction. The specific effects expand trade because the higher the transfer price the less profits are declared by the importing firm.

The total tax rates on the two firms are equal in two cases: where $t_1$ equals $t_2$ under source rules, and where $t_1$ exceeds $t_2$ and b equals the difference between the two stated tax rates divided by the net extra tax levied on foreign profits. Where the tax rates are identical the MNE cannot avoid taxes by shifting trade patterns. The corporation must pay the tax and no changes occur in trade flows.

These results can be summarized as in Table V.2 below. Note that the direction of trade effects is identical to those presented in Table V.1. That is, under deduction rules or no deduction rules the direction of trade movements caused by taxation is the same. The size of changes, however, differs. Under both rules double taxation of firm 2's income occurs but this double taxation is less if deduction

of the foreign tax is permitted. Therefore the degree of change in trade patterns is less under deduction rules, _ceteris paribus_. This is true only where government 1 taxes on the residence principle since under source rules the home government does not tax foreign income.

Table V.2

Trade Effects Under a Fixed $Pm_2$ and Deduction Rules

| Rate of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | specific | ad valorem | specific | ad valorem | specific |
| $b = 0$ | no change | no change | expands | contracts | contracts | expands |
| $0 < b < 1$ | contracts | expands | ambiguous | ambiguous | contracts | expands |
| $b = 1$ | contracts | expands | expands | contracts | contracts | expands |

## The Home Country Credits the Foreign Tax up to its Own Tax

Under credit rules the home government permits the corporation to gross up its foreign income by the appropriate amount of foreign tax and then to deduct this tax from the tax payable to the home government. When source rules apply no double taxation of foreign income occurs and credit rules do not apply. Under the residence-branch rules the MNE grosses up and credits the total income of the branch by the total income taxes paid to government 2. Under the residence-subsidiary rules the MNE grosses up and credits the remitted earnings of the subsidiary by the foreign taxes allocated to the repatriated profits, that is, the corporation grosses up $b(1 - t_2)TT_2$ by $bt_2TT_2$ to give taxable income of $bTT_2$ in country 1. The home government levies taxes

of $bt_1 TT_2$ on this income from which the tax credit of $bt_2 TT_2$ is subtracted. The extra tax paid to the home government is $b(t_1 - t_2)TT_2$. Where $t_2$ exceeds $t_1$ no refund is given. The effect is that the home government sets the lower scoop of taxes out of firm 2's taxable income in country 1. Assuming both countries define 'income' in the same manner, no extra taxation occurs as long as the foreign rate at least equals the domestic income tax rate.

The ad valorem effects cause $MR_1$ to shift to $(1 - t_1)/(1 - t_2 - bt_1 + bt_2)MR_1$ (as does $MC_1$) where the fraction represents the after tax return to firm 1 over the after tax return to firm 2. The ad valorem effects cause trade contraction if firm 2 is the high tax firm; trade expansion if firm 1 is the high tax firm; and no trade movements when the tax rates are equal. The specific effects shift $MR_1$ and $MC_1$ by $[(1 - b)(t_1 - t_2)/(1 - t_2 - bt_1 + bt_2)]Pm_2$, which is the transfer price weighted by the tax differential over the after tax return to firm 2. Where firm 1 has the higher tax rate the specific effects are trade contracting (since a high $Pm_2$ allocates profits to firm 1); where firm 2 is the high tax firm the effects are trade expanding; where the tax rates are equal no trade changes occur. The trade effects therefore depend on $t_1$ compared to $t_2 + bt_1 - bt_2$.

The parent firm has the higher tax rate in the following cases: where $t_1$ exceeds $t_2$ under source rules and where $t_1$ exceeds $t_2$ under residence-subsidiary rules. In these cases the ad valorem effects expand trade while the specific effects are trade contracting.

The foreign firm has the higher tax rate if $t_2$ exceeds $t_1$ for all taxation principles since the home government gives no refund when the foreign tax rate is higher. Even if tax refunds were granted by the

home government when $t_2$ exceeded $t_1$ the total tax rate would still be higher for firm 2 unless full repatriation were achieved. (Compare $t_1$ with $t_2 + bt_1 - bt_2$.) Therefore in the source and residence-subsidiary cases the foreign firm has the higher tax rate whether or not the home government refunds the extra tax credits. The tax differential is less under a tax refund but still against the foreign firm. In the residence-branch case no refund implies firm 2 has the higher tax rate; full refund would bring the tax rates into equality. Where firm 2 has the higher tax rate the ad valorem effects are trade contracting while the specific effects are trade expanding.

The total tax rates faced by both firms are equal in the following situations: $t_1$ equals $t_2$ for all values of b; $t_1$ exceeds $t_2$ in the residence-branch case; $t_2$ exceeds $t_1$ in the residence-branch case and full refund is given by the home government. In these situations the MNE must absorb the total tax bill in lower profits and does not adjust trade flows.

These results are summarized in Table V.3. One can note that in four of the nine possible cases (in five if full refund is given) taxation by both countries has no effects on trade flows. The MNE reacts like a domestic corporation absorbing the taxes without altering output or sales or prices. Also where $t_1$ equals $t_2$ the effects of trade flows are identical no matter what taxation principle is followed by the home country. This is also true where $t_2$ exceeds $t_1$ with no refund. In these cases the taxes are neutral with respect to repatriation rates. Also in comparing the deduction and credit rules, since $bt_2$ exceeds $bt_1t_2$ (where $b > 0$), in cases where the direction of trade flows is identical (if $t_2 > t_1$ and $b > 0$), the size of the flows is smaller in the tax

credit case since the tax differential is smaller. ($t_2 - t_1$ compared to $t_2 - t_1 + bt_1(1 - t_2)$ with or without the refund.)

Table V.3

Trade Effects Under a Fixed $Pm_2$ and Credit Rules

| Rate of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
| --- | --- | --- | --- | --- | --- | --- |
| | ad valorem | specific | ad valorem | specific | ad valorem | specific |
| $b = 0$ | no change | no change | expands | contracts | contracts | expands |
| $0 < b < 1$ | no change | no change | expands | contracts | contracts | expands |
| $b = 1$ | no change | no change | no change | no change | contracts | expands |

## The Home Country Grants LDC Credit up to its Own Tax

Some governments, notably the U.S. government, grant tax credits on ungrossed up foreign income rather than grossed up income. Under source rules this has no effect on trade flows. Under residence-branch rules the corporation faces extra tax of $t_1(1 - t_2)TT_2$ against which can be credited the ungrossed up foreign tax of $t_2(1 - t_2)TT_2$, resulting in extra taxation of $[t_1 - t_1t_2 - t_2(1 - t_2)]TT_2$. Under residence-subsidiary rules the extra tax would be $[bt_1 - [bt_1t_2 + bt_2(1 - t_2)]]TT_2$. We can therefore treat the actual LDC tax credit as $[bt_1t_2 + bt_2(1 - t_2)]TT_2$ although the nominal credit is $bt_2(1 - t_2)TT_2$. Again the effects on trade flows depend on which firm faces the higher total tax rates so we must compare $t_1$ with $t_2 + bt_1 - bt_1t_2 - bt_2(1 - t_2)$.

The ad valorem effects cause the $MR_1$ curve to shift to $[(1 - t_1)/(1 - t_2)(1 - bt_1 + bt_2)]MR_1$ (similarly for $MC_1$). This fraction represents

the after tax profits in firm 1 divided by the after tax profit rate in firm 2. The specific effects cause $MR_1$ and $MC_1$ to shift by the transfer price weighted by the relative tax differential over the after tax return to the foreign firm; that is, by $[(t_1 - t_2)(1 - btbt_2)/(1 - t_2)(1 - bt_1 + bt_2)]Pm_2$. No refund is given where the extra tax levied by the home government is negative, that is where $[bt_1 - bt_1t_2 - bt_2(1 - t_2)]TT_2 < 0$ or $t_2$ exceeds $t_1$.

Where firm 2 has the higher tax rate the ad valorem effects are trade contracting while the specific effects expand trade. Since the importer has the higher tax rate there is a basic disincentive to trade since trade allocates some profits to the importer. This may be offset by the specific effects since the higher the transfer price the larger the profits declared by the exporter. Firm 2 has the higher tax rate in the following cases: where $t_2$ exceeds $t_1$ for all values of b whether or not refunds are given.

Where firm 1 is the high tax firm the ad valorem effects are trade expanding while the specific effects are trade contracting. Firm 1 has the higher tax rate when $t_1$ exceeds $t_2$ for all repatriation rates. Note that in the branch case regular credit rules would mean that all profits of the corporation would face a tax rate of $t_1$ percent wherever earned. Under LDC credit rules, however, with full profit repatriation the tax credit is larger than the regular credit with the result that foreign profits face a tax rate somewhat less than $t_1$ percent. Therefore where $t_1$ exceeds $t_2$ the home firm remains the high tax firm under all taxation principles.

Where both firms face equal tax rates 100% of the tax incidence falls on the MNE and no changes in trade flows occur. This situation

occurs when $t_1$ equals $t_2$ for profit remittance rates from zero to 100 percent.

These results are summarized in Table V.4 below. One can note that for all possible values of $t_1$ and $t_2$ under LDC credit the trade effects are neutral with respect to repatriation rates. The same trade results occur whether the home government follows the source or residence principles. The size of the changes will differ but the direction is the same under either rule. Also that the LDC and regular credit give identical trade movements except for one case--where $t_1$ exceeds $t_2$ and b equals one. The size of trade movements as well as the direction is identical in all cases except where $t_1$ exceeds $t_2$ and residence rules apply. In these two cases the tax credit is larger for the LDC firm so that the tax differential is smaller and changes in trade flows less under regular credit than under LDC credit. (Compare $b(t_1 - t_2)$ with $bt_1 - bt_1t_2 - bt_2(1 - t_2)$.)

Table V.4

Trade Effects Under a Fixed Transfer Price and LDC Credit

| Rate of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | specific | ad valorem | specific | ad valorem | specific |
| b = 0 | no change | no change | expands | contracts | contracts | expands |
| 0 < b < 1 | no change | no change | expands | contracts | contracts | expands |
| b = 1 | no change | no change | expands | contracts | contracts | expands |

Finally where $t_2$ exceeds $t_1$ under residence rules if refunds are given tax differentials are smaller under regular credit rules and therefore

the size of trade movements is smaller. Where no refund is given the tax differentials are equal.


## Summary of Fixed Transfer Price Cases

Under source rules (b = 0) the size and direction of trade movements depends solely on the stated tax rates, $t_1$ and $t_2$, and on the transfer price. Where $t_1$ equals $t_2$ no changes in trade flows occur; where $t_1$ exceeds $t_2$, the ad valorem effects expand trade while the specific effects are trade contracting; where $t_2$ exceeds $t_1$, the trade effects are reversed. Therefore in Tables V.1 to V.4 if b = 0 the results are identical in size and direction.

Since some degree of double taxation persists under deduction rules the direction of trade movements is identical when the home government either permits no form of tax relief or permits deduction. Similarly since LDC credit rules and regular credit rules provide similar kinds of tax relief (except where $t_1$ exceeds $t_2$ in the branch case) the direction of trade movements in Tables V.3 and V.4 are identical.

Although the direction of trade movements is the same the size of the flows may differ. In comparing deduction with no tax relief the degree of double taxation is less under deduction rules and therefore the changes in trade flows are smaller. Where trade movements are the same under regular and LDC credit rules the tax differential is smaller under regular credit when $t_1$ exceeds $t_2$ and when $t_2$ exceeds $t_1$ and tax refunds are given. In these cases the size of trade flows is smaller under regular credit. Where $t_2$ exceeds or equals $t_1$ and refunds are not permitted both forms of credit yield equal tax differentials and therefore equal changes in trade flows.

Only in two cases is the direction of trade flows identical under all four possible types of tax relief--that is, where $t_2$ exceeds $t_1$ under residence rules when the foreign firm is either a branch or a subsidiary. In these cases the ad valorem effects are trade contracting while the specific effects are trade expanding since the foreign firm has the higher total tax rate. If no refund is given both LDC and regular credit result in the smallest tax differentials and therefore the smallest changes in trade flows. The largest changes occur where no form of tax relief is given by the home government.

If the home tax rate, $t_1$, exceeds or equals the stated foreign tax rate, $t_2$, and the goal of the home government is to secure maximum global tax revenue for both governments the regular tax credit should be used. Under regular credit in four out of the six possible cases taxation causes no changes in trade flows and the tax incidence falls wholly on MNE. Maximum tax revenue is generated since the corporation cannot shift the tax to consumers or factors. Also the tax credit involves the least interference with trade flows.

The LDC tax credit is neutral with respect to rates of repatriation since under LDC credit the movement of trade flows is invariable with respect to changes in 'b'. The stated tax rates and the transfer price determine the trade movements.

The specific effects will dominate the ad valorem effects if a high transfer price is used and vice versa if a low $Pm_2$ policy is followed. If the transfer price is fixed at the level of $MC_1$ under free trade the ad valorem and specific effects offset one another and the full tax incidence falls on the MNE. The equilibrium $Pm_2$ policy therefore is an alternative to regular credit as a method of obtaining tax neutrality.

Profit Maximization when the Transfer Price is Based on $AR_1$

Introduction

As shown in Appendix V.2 the basic profit maximizing condition
for the corporation if $Pm_2$ equals $AR_1$ is:

$$MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_1-MR_1] - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}M_2\frac{dAR_1}{dY_1} = MC_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_1-MC_1]$$

$$= MR_2 = MC_2$$

By writing the basic expression in this manner only changes in firm 1's
marginal revenue and marginal costs need to be considered. Also we can
divide the shifts in $MR_1$ and $MC_1$ into two groups: the ad valorem
effects and the rotation effect. The ad valorem effects are so named
because the resulting shifts in the $MR_1$ and $MC_1$ curves vary with the
levels of costs and revenues chosen. The rotation effect is so called
because the new $MR_1$ curve rotates about the old one through the point
where $M_2$ equals zero, that is, where no trade occurs.

Since the corporation in the pretax situation equates $MR_1$ and
$MC_1$ in maximizing profits it must be true that $AR_1$ exceeds or equals
both $MR_1$ and $MC_1$. Depending on the relative tax differential between
the two firms the ad valorem effects shift the marginal revenue and
cost curves up or down. Where firm 1 is the high tax firm the effects
shift $MR_1$ and $MC_1$, acting as a subsidy to domestic sales and a tax on
domestic production, with the result that firm 1's exports decline.
Where firm 2 is the high tax firm the ad valorem effects act as tax on
$Y_1$ and a subsidy to $X_1$, with the result that trade expands. Setting
the transfer price equal to selling price in the exporting firm allocates

profits of $(P_1 - AC_1)M_2$ to firm 1 and $(P_2 - P_1)M_2$ to the importer.
Where $P_1$ exceeds $P_2$ the importer declares losses on trade. That is,
the corporation has set a 'high' transfer price that allocates most or
all of the trade profits to the exporter. Where the exporter is the
low tax firm expanding trade reduces the tax burden on the MNE. However,
when firm 1 is the high tax firm the corporation must reduce trade in
order to minimize tax costs. If the tax rates on the two firms are
equal the ad valorem effects on trade disappear since there is no tax
differential to provide an incentive to trade.

The rotation effect is due to the nature of the transfer price.
When the price is a constant or posted price that does not vary with
output or sales changes in trade flows do not affect the transfer price.
In this case there is no rotation effect. A variable price, however,
that fluctuates with trade movements will affect the trade profits
declared by each firm. Since the MNE is a cost minimizer variable
transfer prices affect the corporation's allocation decisions. In the
$AR_1$ case the transfer price is inversely related to domestic sales
of $Y_1$ so that expanding exports causes the export price to rise. That
is, the $Pm_2 - M_2$ relationship is positive. If the importer is the high
tax firm expanding trade raises the per unit trade profits allocated
to the exporter and lowers those of the importer. This results in
lower taxes and therefore the rotation effect expands trade. If the
exporter is the high tax firm the rotation effect is trade contracting.
If both firms face equal tax rates shifting profits does not reduce
the tax burden so the rotation effect is zero.

Therefore where firm 1 is the high tax firm ($t_1$ exceeds
$t_2 + bt_1 - c$) the ad valorem and rotation effects are trade contracting;

where firm 2 is the high tax firm both effects are trade expanding;
and where tax rates are equal the total tax incidence falls on the
MNE with no changes in trade flows. Since the size of tax relief
provided by the home government has a large effect in determining
which firm is more heavily taxed we therefore turn to an analysis
of possible kinds of tax relief and their effects on trade flows.

## No Credit or Deduction is Given by the Home Country

Where no credit or deduction is given ($c = 0$) firm 1's tax
rate is $t_1$ percent while firm 2's rate is $t_2 + bt_1$ percent. Under source
rules no double taxation occurs; under residence-subsidiary rules, partial
double taxation occurs; under residence-branch rules, full double taxa-
tion results. Where firm 1 is the high tax firm both ad valorem and
rotation effects are trade contracting; where firm 2 is the high tax
firm both effects expand trade. The exporter is the high tax firm in
the following cases: $t_1$ exceeds $t_2$ and either source rules apply or b
is less than $t_1 - t_2/t_1$. The importer is the high tax firm in these
cases: $t_1$ equals $t_2$ under residence rules; $t_1$ exceeds $t_2$ and b exceeds
$t_1 - t_2/t_1$; $t_2$ exceeds $t_1$ for all values of b. The tax rates are equal
where $t_1$ equals $t_2$ under source rules. The results are summarized in
Table V.5 below.

Table V.5

Trade Effects When $Pm_2 = AR_1$ Under no Deduction or Credit

| Rate of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | rotation | ad valorem | rotation | ad valorem | rotation |
| b = 0 | no change | no change | contracts | contracts | expands | expands |
| 0 < b < 1 | expands | expands | ambiguous | ambiguous | expands | expands |
| b = 1 | expands | expands | expands | expands | expands | expands |

Note that the ad valorem effects under a variable transfer price are really a combination of two effects--a shift in $MR_1$ and a shift in $AR_1$ (and a shift in $MC_1$ and in $AR_1$). If $AR_1$ had been a constant transfer price instead of a variable price these subeffects would have been labelled the 'ad valorem' and 'specific' effects. By referring to Table V.1, Trade Effects Under a Fixed $Pm_2$ Where C = 0, we can see that setting $Pm_2 = AR_1$ in effect is similar to setting a high fixed transfer price so that the 'specific' effects outweigh the 'ad valorem' effects. The direction of trade movements shown in Table V.5 under the ad valorem columns is identical to the direction of trade flows shown in Table V.1 under the 'specific' columns. A high transfer price allocates most trade profits to the exporter. The direction of trade movements is further strengthened by the rotation effect which reinforces the ad valorem effects. Under branch rules with no deduction trade unambiguously expands whatever the stated tax rates since the actual tax rate on firm 2 exceeds the tax levied on the home firm.

## The Home Government Permits Deduction of the Foreign Tax

Under the deduction rule firm 1's tax rate is $t_1$ percent while firm 2's is $t_2 + bt_1 - bt_1t_2$ percent. Under residence rules some degree of double taxation must therefore occur. The direction of trade flows will be identical to those shown in Table V.5 but the size of flows will be smaller. It is therefore unnecessary to reproduce the table. Readers may refer to Table V.5 for specific results.

## The Home Government Credits the Foreign Tax Up to its Own Tax

Under credit rules firm 2's tax rate now becomes $t_2 + bt_1 - bt_2$ compared with $t_1$ percent for the exporting firm. Under source rules no extra tax is payable to the home government but under residence rules extra tax is due unless $t_2$ exceeds or equals $t_1$. Refund may or may not be given for extra tax credits if this occurs.

Where the exporting firm has the higher tax rate the ad valorem and specific effects are trade contracting since trade shifts profits to the high tax firm. If the importer has the higher tax rate both effects expand trade. The parent firm is more heavily taxed in the following cases: where $t_1$ exceeds $t_2$ and b is less than one. Firm 2 has the higher rate where $t_2$ exceeds $t_1$ for all b where no refund is given and for b values less than one where refunds are available. The tax rates are equal when $t_1$ equals $t_2$ for all values of b, where $t_1$ exceeds $t_2$ in the residence-branch case, and where $t_2$ exceeds $t_1$ in the residence-branch case with full refund.

These results are summarized in Table V.6. In four cases out of nine no shifting of the tax burden through trade changes occurs. The regular credit is neutral with respect to repatriation rates if $t_2$

exceeds $t_1$. Comparing Table V.6 with Table V.3, <u>Trade Effects Under a</u>
<u>Fixed $Pm_2$ with Credit Rules</u>, one can see that the direction of trade
movements under the 'specific' columns in Table V.3 is identical to those
shown under the ad valorem columns in Table V.6. This is so because
setting $Pm_2 = AR_1$ is equivalent to setting a high transfer price so that
the 'specific' effects dominate.

Table V.6

Trade Effects When $Pm_2 = AR_1$ Under Credit Rules

| Rates of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | rotation | ad valorem | rotation | ad valorem | rotation |
| $b = 0$ | no change | no change | contracts | contracts | expands | expands |
| $0 < b < 1$ | no change | no change | contracts | contracts | expands | expands |
| $b = 1$ | no change | no change | no change | no change | expands | expands |

Finally in the two cases where deduction and credit rules cause the
same direction in trade flows (where $t_2$ exceeds $t_1$ under residence rules)
the tax differential is smaller under the tax credit and therefore the
size of flows is smaller under the credit.

## The Home Country Grants LDC Credit Up to its Own Tax

The importing firm's tax rate now becomes $t_2 + bt_1 - bt_1t_2 - bt_2(1 - t_2)$. This tax rate bears the same relationship to $t_1$ that firm
2's tax rate under regular credit bears to $t_1$ in all cases except where
$t_1$ exceeds $t_2$ in the branch-residence situation. In this case under
regular credit the total tax rates on the two firms are equal and therefore

no changes in trade flows occur. The LDC credit, however, is larger

than the regular credit where $t_1$ exceeds $t_2$ and therefore firm 2's tax

rate remains lower in the branch case. Under LDC credit then the

movements in trade are identical to those under regular credit except

for one case where the ad valorem and rotation effects are trade con-

tracting. The size of flows is generally larger under LDC credit.

Since the results are similar to those shown in Table V.6 the LDC credit

table is not reproduced. For specific cases the reader should refer

to Table V.6 with the one exception noted.


## Summary of $Pm_2 = AR_1$ Case

In general the summarized results for the fixed transfer price

also apply with equal force under variable transfer pricing. Setting

$Pm_2 = AR_1$ implies a high transfer price that allocates most profits to

the exporter. The positive $Pm_2 - M_2$ relationship reinforces any induced

trade movements. Under source rules only the stated tax rates affect

trade flows. Under residence rules the no-tax-relief and deduction

methods yield similar trade movements. Also the regular and LDC credit

rules yield similar results. Under residence rules where $t_2$ exceeds $t_1$

all four methods of tax relief cause trade expansion; the largest changes

under no deduction and the smallest under either form of credit. Regular

credit rules are most likely to generate maximum tax revenue for both

governments where $t_1$ exceeds or equals $t_2$. The LDC credit rules are

neutral with respect to repatriation rates.

Profit Maximization When the Transfer Price is Based on $AC_1$

Introduction

Appendix V.4 shows that the profit maximizing condition for the international corporation when $Pm_2$ equals $AC_1$ is:

$$MR_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MR_1-AC_1] = MC_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MC_1-AC_1] + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}.$$

$$M_2\frac{dAC_1}{dX_1} = MR_2 = MC_2$$

By writing the expression in this way we can separate the influences on trade into two factors; the ad valorem effects and the rotation effect.

Since in the pretax situation the MNE equates $MR_1$ with $MC_1$ it must be true that $AC_1$ either equals or is less than both $MC_1$ and $MR_1$. Where firm 1 has the higher tax rate the ad valorem effects shift $MR_1$ and $MC_1$ down, expanding trade between the two firms. When firm 2 has the higher rate the ad valorem effects act like a subsidy to $Y_1$ and tax on $X_1$, discouraging trade. This can be explained by noting that $AC_1$ is a 'low' transfer price. No trade profits are declared in firm 1; all trade profits are allocated to the importer. Hence, where the exporter has the higher tax rate expanding trade shifts profits to the low tax firm. When firm 2 has the higher rate the corporation reduces intrafirm trade in order to avoid taxes. Where the tax burdens are equal no changes in trade flows occur and the multinational's profits fall by the tax.

Under increasing costs the rotation effect shifts $MC_1$ up over the export range if firm 1 has the higher tax burden, discouraging trade. Where firm 2 has the higher rate the rotation effect expands

trade. As output of $X_1$ rises the average production cost also increases and therefore the $Pm_2 - M_2$ relationship is positive. Trade expansion causes per unit profits allocated to the importer to decline while trade contraction raises the importer's per unit profits. When firm 2 has the higher tax rate the rotation effect is thus trade expanding since firm 2's per unit profits decline while when firm 1 has the higher rate this factor contracts trade.

In summary, if firm 1 has the higher tax rate the ad valorem effects expand trade while the rotation effect contracts trade while if firm 2 has the higher rate the reverse occurs. In general, the ad valorem effects dominate the rotation effect (as long as $Y_1$ exceeds zero). Where the rates are equal no changes in trade flows are induced by the taxes. Since the tax differential depends on the size of the tax relief provided by the home government we turn next to the types of tax relief that could be offered.

## No Credit or Deduction is Given by the Home Country

Where no credit or deduction is permitted by the home government in calculating the extra tax payable on foreign income the tax differential is $t_1 - t_2 - bt_1$. Firm 1 has the higher tax rate when $t_1$ exceeds $t_2$ and b is less than $t_1 - t_2/t_1$. Firm 2 has the higher rate when $t_1$ equals $t_2$ and b is greater than zero; when $t_1$ exceeds $t_2$ and b exceeds $t_1 - t_2/t_1$; and where $t_2$ exceeds $t_1$. The tax rates are equal under source rules when $t_1$ equals $t_2$. Table V.7 presents the direction of trade movements caused by the tax differential.

Table V.7

Trade Effects When $Pm_2 = AC_1$ and no Deduction or Credit is Given

| Rates of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | rotation | ad valorem | rotation | ad valorem | rotation |
| $b = 0$ | no change | no change | expands | contracts | contracts | expands |
| $0 < b < 1$ | contracts | expands | ambiguous | ambiguous | contracts | expands |
| $b = 1$ | contracts | expands | contracts | expands | contracts | expands |

We can compare this table with Table V.5 where the transfer price is based on the exporter's selling price in the home market and no tax relief is given by the home country. The ad valorem trade effects are opposite to each other in these two tables; where one contracts trade, the other is trade expanding. The explanation for this lies in the effect of a 'high' versus a 'low' transfer price on profit allocation. Setting a high $Pm_2$, such as $AR_1$, allocates most profits from trade to the exporter whereas a low $Pm_2$, such as $AC_1$, shifts profits to the importer. The tax differential between the two firms determines how the MNE will react so as to minimize its tax burden. The rotation effect gives identical trade movements whether $Pm_2$ equals $AR_1$ or $AC_1$ since both yield positive export price-export volume relationships. The size of the rotation effects depends on the price elasticity of sales of $Y_1$ compared to the average cost elasticity of output of $X_1$. The more elastic the relationship the greater the volume changes in trade for any given change in $AR_1$ or $AC_1$.

We can also note that although the ad valorem and rotation effects have opposite effects on trade, in general, the ad valorem effects

are stronger until domestic sales of $Y_1$ cease. Where this occurs the rotation effect just compensates for the ad valorem effect on the marginal cost curve, $MC_1$. (See foot note 17 in Chapter IV.) Until sales of $Y_1$ cease the branch case uniformly leads to trade contraction for all possible taxation rates.

## Country 1 Permits Deduction of the Foreign Tax

Since some degree of double taxation remains the movements in trade are identical to those in Table V.7 although smaller in volume.

## Country 1 Grosses Up and Credits the Foreign Tax

The tax comparison is now between $t_1$ and $t_2 + bt_1 - bt_2$. Where firm 1 has the higher tax rate the ad valorem effect expands trade since all trade profits are allocated to the importer. The rotation effect is trade contracting since as trade falls the per unit profits of firm 2 increase. When firm 2 is the high tax firm the ad valorem effects contract trade while the rotation effect is trade creating.

Firm 1 has the higher rate in this case: where $t_1$ exceeds $t_2$ and b is less than one. Firm 2 has the higher rate where: $t_2$ exceeds $t_1$ and no refund is given or where b is less than one when refunds are available. The tax rates are equal in the remaining cases. Table V.8 tabulates these results.

Table V.8

Trade Effects When $Pm_2 = AC_1$ and Regular Credit Rules Apply

| Rates of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | rotation | ad valorem | rotation | ad valorem | rotation |
| $b = 0$ | no change | no change | expands | contracts | contracts | expands |
| $0 < b < 1$ | no change | no change | expands | contracts | contracts | expands |
| $b = 1$ | no change | no change | no change | no change | contracts | expands |

Comparing this table with Table V.6 where $Pm_2 = AR_1$ under credit rules we see that the ad valorem effects are opposite to one another while the rotation effects are identical. Again this is due to 1) the high versus the low transfer price 2) the positive $Pm_2 - M_2$ relationship. The rotation effect does not outweigh the ad valorem cost effect until domestic sales cease in country 1. In four cases the total tax incidence falls on the MNE.

## LDC Credit Rules Apply

LDC and regular credit rules cause the same trade movements in all cases but one--when $t_1$ exceeds $t_2$ under residence-branch rules. In this case the LDC credit is larger and firm 1 therefore has a higher tax rate rather than an equal tax rate as under regular credit rules. Where the trade flows are identical the size of flows are smaller under regular credit since the tax differential is less.

## Summary of $AC_1$ Case

This case is an example of a low transfer price that allocates all export profits to the importer. If the importer is the low tax firm the corporation therefore expands trade in order to minimize its tax costs. The export price-volume relation is also positive so that as trade expands smaller unit profits are declared by the importer. Where firm 2 is the low tax firm this tends to contract trade. As long as firm 1 continues to sell domestically the ad valorem effects will dominate the rotation effect.

### Profit Maximization When the Transfer Price is Based on $MC_1$

The monopolist's profit maximizing condition becomes:

$$MR_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MR_1-MC_1] = MC_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MC_1-MC_1] + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} \cdot$$

$$M_2\frac{dMC_1}{dX_1} = MR_2 = MC_2$$

The ad valorem effects on trade arise because the corporation sets a transfer price that is 'high' or 'low' in relation to marginal cost and marginal revenue in the no-tax situation. Where no tax is levied the transfer price has no effect on the allocative decisions of the MNE; the corporation simply equates $MR_1 - MC_1 = MC_2 - MC_2 = 0$ in maximizing profits. A transfer price that differs from this level of $MR_1 = MC_1$, however, does affect output and sales allocation when taxes are involved, since marginal export profits affect the tax bill levied on the corporation. Depending on the sign of the tax differential and on whether the

transfer price is high or low the corporation will expand or contract trade in order to minimize tax costs. Setting $Pm_2$ equal to $MC_1$ implies zero marginal export profits and therefore no change in trade flows. The ad valorem effects thus disappear when $Pm_2$ equals $MC_1$. The ad valorem effects cause $MR_1$ and $MC_1$ to shift by $-(t_1 - t_2 - bt_1 + c)/$ $(1 - t_2 - bt_1 + c)$ of themselves which is wholly offset by a shift of $+(t_1 - t_2 - bt_1 + c)/(1 - t_2 - bt_1 + c)Pm_2$ since $Pm_2 = MR_1 = MC_1$. Since the transfer price is set at the level at which $MR_1$ and $MC_1$ were initially equal in the pre-tax situation introduction of the tax causes no changes in decision-making and thus profits of the corporation fall by the tax.

This would be the final result if the transfer price were a fixed price, however, if the price varies with output the rotation effect remains. Over the export range this effect causes trade expansion if firm 2 is the high tax firm and trade contraction when firm 1 is the high tax firm. When trade expands the transfer price rises, shifting smaller per unit profits to the importer and larger unit profits to the exporter. When firm 2 is the high tax firm then trade expansion minimizes costs. These rotation effects are identical to those caused by setting $Pm_2$ equal to $AC_1$ or $AR_1$ since all three imply a positive $Pm_2 - M_2$ relationship. The more elastic the relationship, the larger the changes in trade flows. Since the rotation effects are identical in direction and there are no ad valorem effects we can simply repeat the results as summarized in Tables V.7 and V.8 for the no deduction and credit cases where $Pm_2$ equals $AC_1$.

Table V.9

Rotation Effects Where $Pm_2$ is Based on $MC_1$

| Rate of repatriation | No deduction or deduction | | | Regular or LDC Credit | | |
|---|---|---|---|---|---|---|
| | $t_1 = t_2$ | $t_1 > t_2$ | $t_2 > t_1$ | $t_1 = t_2$ | $t_1 > t_2$ | $t_2 > t_1$ |
| b = 0 | no change | contracts | expands | no change | contracts | expands |
| 0 < b < 1 | expands | ambiguous | expands | no change | contracts | expands |
| b = 1 | expands | expands | expands | no change | no change* | expands |

*Under LDC credit trade contracts.

Profit Maximization When the Transfer Price is Based on $AR_2$

Introduction

The profit maximizing condition becomes:

$$MR_2 - \frac{t_1 - t_2 - bt_1 + c}{1 - t_1}[AR_2 - MR_2] - \frac{t_1 - t_2 - bt_1 + c}{1 - t_1}M_2\frac{dAR_2}{dY_2} = MC_2 - \frac{t_1 - t_2 - bt_1 + c}{1 - t_1}[AR_2 - MC_2]$$

$$= MR_1 = MC_1$$

Since the transfer price is based on domestic sales price in the importing country the profit condition has been rewritten in terms of marginal cost and marginal revenue of the importer, firm 2. Again there are two basic effects: the ad valorem effects caused by setting a transfer price different from the pretax equilibrium level of $MR_2 = MC_2$ (in this case a 'high' transfer price) and the rotation effect caused by the negative relation between $AR_2$ and $Y_2$ (and therefore between $AR_2$ and $M_2$).

The ad valorem effects cause a downward shift in $MR_2$ and $MC_2$ if firm 1 is the high tax firm. This discourages imports from firm 1 since the high transfer price allocates all profits to the exporter. When firm 2 has the higher tax rate trade expands since per unit trade profits declared in firm 2 are zero. The direction of trade movements is therefore identical to those caused by setting $Pm_2 = AR_1$ since that also is a high transfer price.

The rotation effect differs from those previously examined since the trade price-volume relationship is negative--expanding trade causes per unit profits of the importer to rise, not fall, while those of the exporter decline. Where firm 1 is the high tax firm the rotation effect is therefore trade expanding while when the importer has the higher tax rate trade contracts.

Therefore when firm 1 has the higher tax rate the ad valorem effects discourage trade while the rotation effect expands trade. Where firm 2 has the higher rate the ad valorem effect is trade expanding while the rotation effect contracts trade. The rotation effect, however, does not overwhelm the ad valorem cost effect until production of $X_2$ ceases in firm 2 (see foot note 18 in Chapter IV) so that in general the ad valorem effects predominate.

No Deduction or Deduction Rules Apply

Since the direction of trade movements is identical under no-tax-relief and deduction rules (although the size of movements is smaller under deduction) we may consider the two forms of relief together.

Firm 1 has the higher tax rate when $t_1$ exceeds $t_2$ and source rules apply. Where residence-subsidiary rules apply the actual rate of

repatriation must be known in order to predict the direction of trade effects. Firm 2 has the higher rate when: $t_1$ equals $t_2$ under residence rules; $t_1$ exceeds $t_2$ and firm 2 is a branch; $t_2$ exceeds $t_1$. In the remaining cases the tax rates are equal. These results are summarized below.

Table V.10

Trade Effects When $Pm_2 = AR_2$ Under No Deduction or Deduction

| Rate of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | rotation | ad valorem | rotation | ad valorem | rotation |
| b = 0 | no change | no change | contracts | expands | expands | contracts |
| 0 < b < 1 | expands | contracts | ambiguous | ambiguous | expands | contracts |
| b = 1 | expands | contracts | expands | contracts | expands | contracts |

## Regular Credit or LDC Credit Rules Apply

Since the direction of trade movements is identical for all cases but one under either form credit rules we may consider them together. The flows differ when $t_1$ exceeds $t_2$ in the branch case since the LDC credit is larger than the regular credit. Under regular credit in this case all profits face taxation at $t_1$ percent so no changes in trade flows occur while under LDC credit firm 1 has the higher tax rate so that the ad valorem effects contract trade while the rotation effect is trade expanding.

Firm 1 has the higher tax rate when: $t_1$ exceeds $t_2$ and b is less than one. Firm 2 has the higher tax rate where $t_2$ exceeds $t_1$. The tax rates are equal in the remaining cases.

Table V.11

Trade Effects Where $Pm_2 = AR_2$ Under Credit Rules

| Rate of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
| --- | --- | --- | --- | --- | --- | --- |
| | ad valorem | rotation | ad valorem | rotation | ad valorem | rotation |
| $b = 0$ | no change | no change | contracts | expands | expands | contracts |
| $0 < b < 1$ | no change | no change | contracts | expands | expands | contracts |
| $b = 1$ | no change | no change | no change | no change* | expands | contracts |

*Under LDC rules the ad valorem effects contract trade while the rotation effect expands trade.

Profit Maximization When the Transfer Price is Based on $AC_2$

The profit maximizing condition becomes:

$$MR_2 + \frac{t_1-t_2-bt_1+c}{1-t_1}[MR_2-AC_2] = MC_2 + \frac{t_1-t_2-bt_1+c}{1-t_1}[MC_2-AC_2] +$$

$$\frac{t_1-t_2-bt_1+c}{1-t_1}M_2\frac{dAC_2}{dX_2} = MR_1 = MC_1$$

This transfer price is an example of a low transfer price with a negative $Pm_2 - M_2$ relationship. Most profits are allocated to the importer. As trade expands per unit profits of the importer rise. When firm 1 is the high tax firm therefore, both ad valorem and rotation effects expand trade. When firm 2 is the high tax firm both effects contract trade. The trade effects therefore reinforce one another. Referring to the tax rate differentials noted in the previous transfer price cases we can summarize the trade results as follows.

Table V.12

Trade Effects When $Pm_2$ = $AC_2$ under No Deduction or Deduction

| Rate of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | rotation | ad valorem | rotation | ad valorem | rotation |
| b = 0 | no change | no change | expands | expands | contracts | contracts |
| 0 < b < 1 | contracts | contracts | ambiguous | ambiguous | contracts | contracts |
| b = 1 | contracts | contracts | contracts | contracts | contracts | contracts |

Table V.13

Trade Effects When $Pm_2$ = $AC_2$ Under Regular Credit Rules

| Rate of repatriation | $t_1$ equals $t_2$ | | $t_1$ exceeds $t_2$ | | $t_2$ exceeds $t_1$ | |
|---|---|---|---|---|---|---|
| | ad valorem | rotation | ad valorem | rotation | ad valorem | rotation |
| b = 0 | no change | no change | expands | expands | contracts | contracts |
| 0 < b < 1 | no change | no change | expands | expands | contracts | contracts |
| b = 1 | no change | no change | no change | no change | contracts | contracts |

Summary of Trade Influences

When Both Countries Tax Pure Profits

The previous analysis can be summarized as depending on three main factors:

1) the relative tax differential between the two firms, that is, which firm has the higher tax rate;

2) the transfer price, whether it is 'low' or 'high' or set equal to the level at which $MR_1$ = $MC_1$ = $MR_2$ = $MC_2$ in the pretax situation;

3) whether the transfer price is fixed or varies with the volume of trade. The tax differential determines whether the ad valorem and specific effects in the fixed transfer price cases or the ad valorem and rotation effects in the variable $Pm_2$ cases are positive, negative or zero. It determines the direction of trade flows and the size of flows. The transfer price also determines the direction and size of flows since it affects the allocation of trade profits between the two firms. A variable transfer price introduces an additional complication that can reinforce or weaken the ad valorem effects.

## The Tax Differential

The tax differential depends on whether the home country follows the source or residence principle; whether firm 2 is a branch or a subsidiary; and the form of tax relief provided by the home government. The results can be summarized as follows:

### Firm 1 Has the Higher Tax Rate

When $t_1$ exceeds $t_2$ and source rules apply; or residence-subsidiary rules apply under credit and LDC credit; or residence-branch rules apply under LDC credit. Where $0 < b < 1$ under no deduction or deduction the results are ambiguous.

### Firm 2 Has the Higher Tax Rate

1. When $t_1$ equals $t_2$ under residence rules and no deduction or deduction forms of tax relief.

2. When $t_1$ exceeds $t_2$ and firm 2 is a branch under deduction, or no deduction. Where $0 < b < 1$ the result is ambiguous under deduction or no deduction.

3. When $t_2$ exceeds $t_1$ for all values of b and all 4 forms of tax relief with or without refund except where b = 1, regular credit applies and full refund is given.

The Tax Rates are Equal

1. When $t_1$ equals $t_2$ and source rules apply; and where residence rules apply under regular and LDC credit.

2. When $t_1$ exceeds $t_2$ and branch rules apply for regular credit; the result is ambiguous under no deduction and deduction where $0 < b < 1$.

3. When $t_2$ exceeds $t_1$ in the branch case where regular credit and full refund is given.

Where the exporter has the higher rate the goal of the corporation is to shift profits to the importer where they face lower taxation. Where the importer has the higher rate the MNE attempts to shift profits to the exporter. Where the tax rates are equal no trade shifts occur and the corporation's profits fall by the tax. We therefore turn to the second factor, the transfer price, since this affects the allocation of trade profits between the two firms.

The Transfer Price

When the exporter has the higher tax rate the corporation would prefer to set a low export price that would shift most trade profits to the importer so that expanding trade would minimize tax costs. Such as price would be $AC_1$ or $AC_2$. If the corporation is forced to set a high transfer price by tax or tariff authorities in order to reduce tax costs the MNE contracts trade. Prices such as $AR_1$ or $AR_2$ are therefore

trade contracting where firm 1 has the higher tax rate. If the transfer price is set equal to the pretax equalized $MR_1 = MC_1 = MR_2 = MC_2$ level expanding or contracting trade does not affect tax costs with the result that no changes in trade flows occur.

Where the importer has the higher tax rate a high transfer price ($AR_1$ or $AR_2$) would cause trade expansion while a low price results in trade contraction ($AC_1$ or $AC_2$). An 'equilibrium' transfer price (such as $MC_1$, $MC_2$, $MR_1$ or $MR_2$) would cause no change in trade flows. And where tax rates are equal no changes occur under a fixed transfer price, however, where the transfer price varies with export volume the rotation effect can affect trade flows.

## The Rotation Effect

A positive $Pm_2 - M_2$ relationship shifts larger unit trade profits to the exporter when trade expands and to the importer when trade contracts. Such a relationship occurs when the transfer price is based on $AR_1$, $AC_1$, or $MC_1$. If firm 1 has the higher tax rate the rotation effect thus contracts trade, while if the importer has the higher rate trade expands. This may reinforce the ad valorem effects (the $AR_1$ case) or weaken them ($AC_1$) but in general does not outweigh the ad valorem effects (unless sales of $Y_1$ cease in the $AC_1$ case).

A negative $Pm_2 - M_2$ relationship shifts larger profits to the exporter as trade contracts and to the importer, as trade expands. Under prices such as $AR_2$, $AC_2$ or $MC_2$; where firm 1 has the higher tax rate trade therefore expands while when firm 2 has the higher rate trade contracts. This may reinforce the ad valorem effects ($AC_2$) or weaken them ($AR_2$) but does not outweigh them (unless production of $X_1$ ceases in the $AR_2$ case).

A zero $Pm_2 - M_2$ relation exists where the transfer price is fixed.

## Conclusions

The goal of the multinational enterprise faced by tax barriers is to maximize its after-tax total profits by reallocating output and sales among its divisions, adjusting transfer prices and altering profit remittance rates. Governments, now aware of these tax avoidance practices, have taken steps to prevent them and to increase their national share of the total taxes paid by multinationals to all governments. Uneven tax rates, tax exemptions and tax deferrals have afforded the MNE's many opportunities to reduce taxes--opportunities not available to national enterprises. As each government attempts to attract foreign investment and increase its national benefits from trade the confusion of tax policies results in lower total taxes for all as multinationals alter trade flows to minimize tax costs. Aware of this fact, many developed countries are now equalizing their corporate profit tax rates (most tax rates now cluster in the 40 to 50 percent range), and often give tax credit relief for remitted foreign profits.

Where both home and host governments tax multinational profits problems of tax neutrality, inter-nation equity and interindividual equity can arise. Complete tax neutrality is only assured in the following cases:

1. If the stated tax rates, $t_1$ and $t_2$, are equal and both countries apply the source rule no double taxation occurs. The rate of repatriation has no affect in this situation.

2. If $t_1$ equals $t_2$ and the home government grants regular or LDC credit relief, whatever the remittance rate, tax neutrality is maintained.

3. If the home country has the higher stated tax rate and no available tax relief if b equals $t_1 - t_2/t_1$ is given; or deduction relief if b equals $t_1 - t_2/t_1 - t_1 t_2$ is given; or regular credit relief if b equals one is given, tax neutrality is not disturbed.

4. If the host country's stated tax rate is higher and the home government credits foreign branch profits and gives a full refund tax neutrality is maintained.

In these four situations the MNE does not alter its behavior in the light of the tax. It absorbs the full tax incidence and does not attempt to shift it to consumers or factors. Total tax revenues are maximized in these cases.

5. There is one other situation that fulfills the conditions for tax neutrality. If the transfer price is set equal to marginal production cost as determined by the volume of output of the exporting firm under free trade (where $MR_1 = MC_1 = MR_2 = MC_2$), this fixed $Pm_2$ implies marginal zero export profits. Since both marginal domestic tax and marginal export tax are zero the corporation has no incentive to shift profits from foreign to domestic sales or vice versa. The corporation absorbs the tax and pays the maximum tax revenue. The stated tax rates, the remittance rates and forms of tax relief as determined by the home and host governments have no effect on this result. However, this is a special transfer price--any level of marginal cost other than the 'equilibrium' level will cause changes in trade flows and affect tax neutrality. Also the transfer price must be a fixed or posted price

since a variable transfer price will generate a rotation effect.
Marginal cost pricing implies a positive export price-volume relationship
that will generally distort resource allocation decisions.

If complete tax neutrality is maintained inter-nation equity
is only affected to the extent that the host government captures part
of MNE profits through taxation. The tax revenue so collected is
$t_2[X_2(P_2 - AC_2) + M_2(P_2 - Pm_2)]$. The higher the transfer price is set
the smaller the tax gains of the host importing country (assuming tax
neutrality) for any tax rate. Under these conditions 'fair market value'
transfer prices are biased in favor of the exporting country since tax
neutrality is maintained most often in situations where the home country's
tax rate equals or is higher than that of the host government.

If there is a tax differential and an equilibrium fixed transfer
price is not applied double taxation of multinational profits occurs.
The MNE reacts by distorting trade flows so as to minimize its tax
costs, shifting part of the tax incidence to consumers or factors. Inter-
nation equity is affected not only by the tax revenue collected by the
host government, but also by changes in consumer surpluses and real
factor incomes. For example, a variable transfer price based on $AR_1$
will cause trade volume expansion if the actual home tax rate exceeds
the foreign rate ($t_1$ exceeds $t_2 + bt_1 - c$) or trade contraction if the
foreign rate is higher. If trade expands consumers in the exporting
country lose consumer surplus while consumers of $Y_2$ gain surplus. If,
as production of $X_1$ expands, factor prices rise, the loss in consumer
surplus on the uses side may be partially offset by gains in factor
incomes on the sources side in country 1. In country 2 factor incomes
may decline if the MNE can affect factor prices. The division of

national gains is therefore affected since the host government gains tax revenue; consumers of $Y_2$ gain surplus while factors employed in producing $X_2$ may suffer losses in real income if trade expands as a result of taxation. If trade declines inter-nation equity is again affected. The smaller the tax differential the smaller the resulting changes in trade flows and in consumer, factor and government gains and losses from intrafirm trade, ceteris paribus.

In summary, tax neutrality is achieved only under certain circumstances. Either specific tax and remittance rates and forms of tax relief must apply simultaneously or a fixed equilibrium transfer pricing policy must be followed. Inter-nation equity is affected even if tax neutrality is maintained since through taxation the host country captures part of the producer gains from trade. Where taxes are non-neutral total tax revenues generated by both governments are not maximized as resource allocation patterns of the MNE are distorted. As the multi-national shifts part of its tax burden to consumers and factors the national gains from trade are further altered.

Chapter VI

The Behavior of the Multinational Enterprise

Under Tax and Tariff Barriers


Introduction

This chapter completes the model developed in this thesis of

two horizontally integrated firms engaged in intrafirm trade for the

purpose of maximizing total corporate profits.  In this chapter we deter-

mine whether or not the behavior of the MNE can be predicted if both

taxes and/or a tariff constrain corporate decision-making.

In Chapter III we found that tariffs affect the size of trade

movements in one direction only since the tariff applies only to trade

flows from the exporter to the country levying the tariff.  If the MNE

follows a fixed transfer pricing policy the effects of the tariff

unambiguously contract trade since any transfer price greater than zero

imposes a tariff cost on the MNE that reduces profits.  If a variable

$Pm_2$ policy is followed the trade effects are more complicated.  A

transfer price that rises as the volume of trade increases and vice

versa reinforces the trade contracting effects.  However, transfer prices

such as $AR_2$ and $AC_2$, generate ambiguous results since the ad valorem

tariff effects are trade reducing while the rotation tariff effect

expands trade.  It is therefore possible for the tariff to cause trade

expansion, contraction or cessation of trade but never trade reversal.

Once the change in trade movements is known the effects of the tariff

on the real incomes of the exporting and importing countries, on

consumers and factors in these countries, and on the Balance of Payments

between them can be predicted.

In Chapter V we found that taxes can cause trade expansion, contraction, reversal or no change at all depending on the actual tax differential, the transfer price and the $Pm_2 - M_2$ relationship. Whether the home country follows source or residence principles; whether firm 2 is a branch or subsidiary, what form of tax relief is given by the home government, all affect the size of the tax differential and therefore the movement and volume of trade. If firm 1 is the high tax firm the corporation attempts to shift profits to firm 2 via a low transfer price and/or trade expansion. If firm 2 has the high tax firm a high transfer price and/or trade contraction follows. Whether the price-volume export relationship is positive, negative or zero also affects trade flows but, in general, the ad valorem effects outweigh the rotation effect. Again, knowing the change in trade flows, predictions about changes in incomes, the gains or losses from trade and about the Balance of Payments can be made.

In this chapter the model consists of two related firms engaged in domestic production and sales and in intrafirm trade. The goal of the corporation is to maximize pure after-tax profits. Both countries levy taxes; $t_1$ percent on firm 1's profits and $t_2 + bt_1 - c$ percent on firm 2, where 'b' represents that part of firm 2's profits legally taxable in country 1 ($0 \leq b \leq 1$) and 'c' represents the form of tax relief given by country 1 (no relief, deduction, credit, or LDC credit). The conditions under which firm 1 has the higher tax rate; firm 2 has the higher rate; and the tax rates are equal, are given in Chapter V and are not repeated here. For the specific cases the reader is asked to refer to the previous chapter.

In addition to taxing firm 2's profits at $t_2$ percent, country 2 levies a tariff on imports at rate r percent. Again, as in Chapter III, this rate is to be interpreted not as the stated tariff rate but as the ratio of the actual tariff revenue paid to government 2 over the value of firm 2's imports as computed internally within the MNE. If the customs authorities accept the corporation's transfer price for customs valuation purposes the actual and stated tariff rates are equal. However, if the authorities adjust the transfer price upwards the actual rate will exceed the stated rate. The symbol 'r' is therefore to be interpreted as the actual tariff rate levied on firm 2's imports (that is, adjustment has been made if the MNE's transfer price and the customs valuation differ). The tariff costs are assumed deductible by firm 2 in computing its taxable income.

If firm 1 has the higher tax rate the corporation attempts to shift profits to the importer via lower transfer prices and/or trade contraction, both of which tend to reduce tariff costs. Where firm 2 has the higher rate a high transfer price and/or trade expansion shifts profits to firm 1 but both imply high tariff costs. The tax problem is therefore complicated by the introduction of the tariff. The net impact on corporate behavior thus depends on the interaction between the tax differential, the tariff, the transfer price and the $Pm_2 - M_2$ relationship.

If firm 2 is the exporter the tariff does not apply and the corporation is faced only with the tax problem which has been discussed in Chapter V. We therefore ignore the case where firm 2 is the exporter so that 'trade' in this chapter, as in the previous one, refers only to exports by the parent firm to the foreign firm.

## Profit Maximization Under Tax and Tariff Barriers

### Profit Maximization with a Fixed Transfer Price

If the corporation follows a fixed transfer pricing policy the profit maximizing condition under both tariff and trade barriers as shown in Appendix VI.1 is:

$$\frac{1-t_1}{1-t_2-bt_1+c}MR_1 + [\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]Pm_2 = \frac{1-t_1}{1-t_2-bt_1+c}MC_1 +$$

$$[\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}]Pm_2 = MR_2 = MC_2$$

If the tariff rate is zero this condition is identical to the profit maximizing condition with a fixed $Pm_2$ and taxation by both governments as given in Cahpter V. If the actual tax rates are equal or are both zero the condition reduces to $MR_1 + rPm_2 = MC_1 + rPm_2 = MR_2 = MC_2$, the basic condition under a tariff and a fixed transfer price demonstrated in Chapter III. Assuming, for the moment, that neither of these two possibilities holds, we can separate the effects of the corporate taxes and the tariff on the behavior of the MNE into two general groups: the ad valorem effects and the specific effects.

The ad valorem effects shift $MR_1$ and $MC_1$ either up (contracting trade) or down (expanding trade) depending on the ratio of after tax rate of returns in the two firms. If the parent has the higher tax rate trade expands since through expansion the corporation can shift profits to the importer. Where firm 2 has the higher rate trade contracts in order to avoid tax. The tariff plays no role in the ad valorem effects since it only operates via $Pm_2$.

The specific effects can be separated into two subgroups: the specific tax effects and the sepcific tariff effects. The specific tax effects cause $MR_1$ and $MC_1$ to shift up, contracting trade, if firm 1 has the higher tax rate, or down, expanding trade, if firm 2 has the higher rate. This is the effect of the transfer price since the higher the transfer price the more trade profits are allocated to the exporter and the less to the importer. Where the exporter is more heavily taxed, trade thus contracts while where the importer faces the higher burden, trade expands. The specific tariff effects shift $MR_1$ and $MC_1$ up by $rPm_2$, the per unit tariff costs, and therefore unambiguously reduce trade. The higher the transfer price the more trade contracts. The direction of this effect is independent of the tax differential between the two firms.

In summary, when the tariff rate is zero the standard tax results apply. When the actual tax rates, $t_1$ and $t_2 + bt_1 - c$, are both zero or are equal to one another, the standard tariff results apply. Where a differential exists in tax rates and there is a tariff both affect trade flows and may reinforce or offset each other. If firm 1 has the higher tax rate the ad valorem effects expand trade while the specific effects, both tax and tariff, contract trade. If firm 2 has the higher rate the ad valorem effects contract trade while the specific tax effect is trade expanding and the specific tariff effect is trade contracting. Where the tax rates are equal the ad valorem and specific tax effects disappear but the specific tariff effect contracts trade.

When firm 1 has the higher tax rate both specific effects are trade contracting since the higher the transfer price the more profits allocated to firm 1 and the higher the tariff costs. When firm 2 has

the higher rate the specific tax effect expands trade while the tariff effect contracts trade. Under what conditions does one effect outweigh the other? The tax effect shifts $MR_1$ and $MC_1$ down by $[(t_1 - t_2 - bt_1 + c)/(1 - t_2 - bt_1 + c)]Pm_2$ while the tariff effect shifts $MR_1$ and $MC_1$ up by $rPm_2$. The specific tariff effect dominates the tax effect if the tariff rate exceeds the ratio of the tax differential between the two firms divided by the after tax rate of return to firm 2. That is, we must compare

$$r \gtreqless \frac{t_1 - t_2 - bt_1 + c}{1 - t_2 - bt_1 + c} \, .$$

Where the tariff rate is larger the net specific effect is trade contracting; where the tax differential is larger trade expands; and where they are equal the effects cancel one another and only the ad valorem effects remain.

The size of the transfer price also influences the movement of trade. A high fixed transfer price implies that the specific tax effects will outweigh the ad valorem effects. If firm 1 has the higher tax rate, for example, a high $Pm_2$ causes net trade contraction which is further reinforced by the specific tariff effects. A low $Pm_2$ implies that the ad valorem tax effects dominate the specific tax effect. And setting an equilibrium $Pm_2$ (equal to $MC_1$ under free trade) implies that the two tax effects cancel and only the tariff effect remains.

An examination of the revenue gains of each government provides another explanation of the changes in trade movements. Firm 1 pays tax revenue of $t_1(Pm_2 - AC_1)M_2$ on its intrafirm trade profits to government 1. Firm 2 pays revenues to both governments of $(t_2 + bt_1 - c)[P_2 - (1 + r)Pm_2]M_2 + rPm_2M_2$ on its trade profits. Firm 2's tax and tariff

costs can be rewritten as: $(t_2 + bt_1 - c)(P_2 - Pm_2)M_2 + r(1 - t_2 - bt_1 + c)$ $Pm_2M_2$. That is, firm 2 pays tax costs of its tax rate multiplied by its trade profits plus tariff costs of the tariff revenues multiplied by the after tax rate of return to firm 2. Let us call the tariff costs, $r(1 - t_2 - bt_1 + c)Pm_2M_2$, the 'effective' tariff costs which must be smaller than the actual costs of $rPm_2M_2$ if firm 2 pays any tax. This is because tariff costs are tax deductible and therefore reduce the total burden on the importing firm somewhat. The greater the tax rate on firm 2's profits the more the effective tariff costs are reduced, ceteris paribus. If firm 2's tax rate declines the effective per unit tariff costs are increased since $r(1 - t_2 - bt_1 + c)$ increases. Therefore, although the tariff effect is always trade contracting, where firm 1 has the higher tax rate, the specific tariff effect is stronger compared to the case where firm 2's rate is higher. Trade contraction is greater if firm 1 has the higher tax rate since the tax reductions in firm 2 for any tariff rate are smaller. The trade effects may be summarized as in Table VI.1 below.

Table VI.1

Trade Effects Under a Fixed Transfer Price

| Trade Effects | Firm 1 has higher tax rate $(t_1 > t_2 + bt_1 - c)$ | Firm 2 has higher tax rate $(t_2 + bt_1 - c > t_1)$ | Tax rates are equal $(t_1 = t_2 + bt_1 - c)$ |
|---|---|---|---|
| ad valorem | expands | contracts | no change |
| specific tax | contracts | expands | no change |
| specific tariff | contracts | contracts | contracts |

Profit Maximization Where $Pm_2$ is Based on $AR_1$

As shown in Appendix VI.1 the profit maximizing condition becomes:

$$MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_1-MR_1] + rAR_1 - [\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]M_2\frac{dAR_1}{dY_1} =$$

$$MC_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_1-MC_1] = rAR_1 = MR_2 = MC_2$$

We can divide the effects on trade into ad valorem and rotation effects which can each be subdivided into tax and tariff effects. The ad valorem effects consist of ad valorem tax and tariff effects. The ad valorem tax effects expand trade if firm 2 has the higher tax rate and contract trade when firm 1 has the higher rate. Setting $Pm_2$ equal to $AR_1$ involves a high transfer price that allocates most profits to the exporter so that if the exporter has the higher rate trade contracts.

The ad valorem tariff effects shift $MR_1$ and $MC_1$ up by $rAR_1$, contracting trade. The high transfer price implies high tariff costs for firm 2 so that when firm 1 has the higher tax burden both ad valorem effects contract trade; while when firm 2 has the higher rate the tax and tariff effects, however, are opposite. To determine the net ad valorem trade impact we must compare $rAR_1$ with $\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_1-MR_1]$.

The comparison is not directly between the tax differential over the after tax return to firm 2 and the tariff rate as in the specific effects in the previous section but between the per unit tariff costs and $(AR_1-MR_1)$ times the ratio of the tax differential over the net after tax return to firm 2. Where $MR_1$ equals $AR_1$ (that is, domestic sales of $Y_1$ are zero),

the tariff effect dominates and trade contracts because within the
ad valorem tax effect two processes are involved. First, the $MR_1$ and
$MC_1$ curves shift up by the tax differential (since firm 2 has the higher
tax rate) forcing the MNE to contract trade in order to reduce tax
costs. But setting a high $Pm_2$ is trade expanding because most trade
profits are allocated to the exporter where they face lower tax. Where
$AR_1$ equals $MR_1$ these effects cancel and therefore the tariff effect
dominates. Where $AR_1$ exceeds $MR_1$ the ad valorem tax effect expands
trade, which may or may not outweigh the ad valorem tariff effect.

We can also examine the tax and tariff costs of each firm
where firm 2 has the higher tax rate as an explanation of the opposing
ad valorem effects. Firm 1 pays per unit taxes of $t_1(P_1-AC_1)$ on exports
while firm 2 pays tax and tariff unit trade costs of $(t_2 + bt_1 - c)$
$[P_2 - (1 + r)P_1] + rP_1$ which can be rewritten as $(t_2 + bt_1 - c)(P_2 - P)$
$+ r(1 - t_2 - bt_1 + c)P_1$. The high transfer price allocates most trade
profits to the exporter whose tax rate is lower which means unit profits
in firm 2 are small but face a high tax rate. The actual tariff costs
of firm 2 are, however, high (since $Pm_2$ is high) but the effective tariff
costs are lower since tariff costs are tax deductible. Although the
tariff effect is trade contracting it is not as strong since effective
tariff costs are reduced by the high tax rate.

The rotation trade effects can be also subdivided into tax
and tariff effects. The rotation tax effects shifts $MR_1$ up by
$-(\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c})M_2\frac{dAR_1}{dY_1}$ over the export range where firm 1 has the higher
tax rate, thus discouraging trade. Where firm 2 has the higher rate
the effect is trade expanding. Basing $Pm_2$ on $AR_1$ implies that as exports
expand the transfer price rises, allocating larger unit profits to the

exporter and less to the importer. If the exporter has the higher

tax burden this effect therefore contracts trade. The rotation tariff

effect shifts $MR_1$ up by $-rM_2(dAR_1/dY_1)$, contracting trade since trade

contraction causes the transfer price to fall and tariff costs to

decline. In summary, where firm 1 has the higher tax rate both rotation

effects are trade contracting. Where firm 2 has the higher rate we

must compare the tariff rate to $\dfrac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}$ in order to determine which

rotation effect, the tax or tariff, dominates the other since the effects

are contradictory. If the tax effect is stronger trade expands whereas

if the tariff effect dominates, trade contracts.

The effects of trade barriers on corporate behavior are

summarized in Table VI.2.


### Table VI.2

### Trade Effects Where $Pm_2$ is based on $AR_1$

| Trade effects | Firm 1 has higher tax rate | Firm 2 has higher tax rate | Actual tax rates are equal |
|---|---|---|---|
| ad valorem | | | |
|     tax | contracts | expands | no change |
|     tariff | contracts | contracts | contracts |
| rotation | | | |
|     tax | contracts | expands | no change |
|     tariff | contracts | contracts | contracts |


If firm 1 has the higher tax rate all four effects contract

trade. Where the tax rates are equal only the tariff effects remain

and trade contracts. The results are ambiguous when firm 2 has the

higher tax rate.

Profit Maximization Where $Pm_2$ is Based on $AC_1$

The condition for maximum profits when $AC_1$ is the transfer price is:

$$MR_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MR_1-AC_1] + rAC_1 = MC_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MC_1-AC_1] + rAC_1 +$$

$$[\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]M_2\frac{dAC_1}{dX_1} = MR_2 = MC_2$$

The effects on trade flows can be divided into ad valorem and rotation effects. The ad valorem tax effect expands trade when firm 1 is the high tax firm and contracts trade when the importer faces the higher tax rate because the low transfer price allocates all trade profits to the importer. The ad valorem tariff effect contracts trade since as trade expands $AC_1$ rises and tariff costs increase. Where firm 2 is the high tax firm both ad valorem effects contract trade but where firm 1 has the higher rate the effects are contradictory. To determine the net effect we must compare $rAC_1$ with $\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MC_1-AC_1]$.

A transfer price of $AC_1$ implies that zero trade profits are declared by the exporter and therefore no tax costs are paid by firm 1 on exports. Firm 2 pays unit tax and tariff costs of $(t_2 + bt_1 - c)(P_2 - AC_1) + r(1-t_2-bt_1+c)AC_1$ on imports. Since all trade profits are allocated to the importer high per unit tax costs are paid (which are, however, less than what would have been paid by firm 1 had all trade profits been declared there since firm 1 has the higher tax rate). Also the effective tariff costs are somewhat larger in this case than if firm 2 had been the high tax firm since the tax deductions are smaller.

The rotation effects can be subdivided into tax and tariff effects. The rotation tax effect contracts trade when firm 1 has the higher tax rate since as trade contracts per unit trade profits declared by firm 2 rise. Where firm 2 has the higher rate trade expands causing unit profits of firm 2 to contract. The rotation tariff effect contracts trade since as trade falls the transfer price declines and tariff costs fall. When firm 2 has the higher rate the net rotation effect depends on the tariff rate compared to the ratio of the tax differential over the after tax return to firm 2. When firm 1 has the higher rate both rotation effects contract trade.

Table VI.3

Trade Effects Where $Pm_2$ Equals $AC_1$

| Trade Effects | Firm 1 has higher tax rate | Firm 2 has higher tax rate | Actual tax rates are equal |
|---|---|---|---|
| ad valorem | | | |
|     tax | expands | contracts | no change |
|     tariff | contracts | contracts | contracts |
| rotation | | | |
|     tax | contracts | expands | no change |
|     tariff | contracts | contracts | contracts |

Where the tax rates are equal trade unambiguously contracts. Where firm 2 has the higher tax rate the ad valorem tax effect outweighs the rotation tax effect as long as $Y_1$ is positive. Therefore, in general, trade contracts when firm 2 has the higher or the same tax rate as the parent firm. If the tariff effects are strong, and firm 1 has the higher rate, trade also probably contracts.

## Profit Maximization Where $Pm_2$ is Based on $MC_1$

The profit maximizing condition becomes:

$$MR_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MR_1-MC_1] + rMC_1 = MC_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MC_1-MC_1] + rMC_1 +$$

$$[\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]M_2\frac{dMC_1}{dX_1} = MR_2 = MC_2$$

With the transfer price based on marginal cost of the exporter the corporation chooses a price such that the ad valorem tax effects reduce to zero. Ignoring the transfer price initially, the MNE will expand trade if the exporter faces the higher tax rate since through trade there is the possibility of tax reduction. The higher the transfer price, however, the larger the per unit export profits allocated to firm 1 and the smaller the tax savings from trade. Where $Pm_2$ is based on $MC_1$ (and therefore also equal to $MR_1$) these two conflicting factors negate one another. Similarly if firm 2 has the higher tax rate the MNE prefers trade contraction but the higher is $Pm_2$, the more profitable is trade expansion. The effects cancel one another if the transfer price is an equilibrium price. However, the ad valorem tariff effects remain and unambiguously contract trade since tariff costs of $rMC_1$ are levied on each unit of exports. The total ad valorem effects are therefore unambiguously trade contracting for all tax rates.

The rotation tax effect causes trade contraction if firm 1 is the high tax firm and expansion when firm 2 is the high tax firm since as trade expands per unit profits of the exporter increase while those

of the importer fall and vice versa if trade contracts. The rotation
tariff effect causes trade contraction because as trade contracts per
unit tariff costs decline.

Table VI.4

Trade Effects Where $Pm_2$ is Based on $MC_1$

| Trade Effects | Firm 1 has higher tax rate | Firm 2 has higher tax rate | Actual tax rates are equal |
|---|---|---|---|
| ad valorem | | | |
|     tax | no change | no change | no change |
|     tariff | contracts | contracts | contracts |
| rotation | | | |
|     tax | contracts | expands | no change |
|     tariff | contracts | contracts | contracts |

Where tax rates are equal or firm 1 has the higher rate
trade declines unambiguously; however, where firm 2 has the higher rate
the results are uncertain.

Profit Maximization Where $Pm_2$ is Based on $AR_2$

The profit maximizing condition becomes:

$$MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_2-MR_1] + rAR_2 + [\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]M_2\frac{dAR_2}{dY_2} = MC_1 +$$

$$\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_2-MC_1] + rAR_2 = MR_2 = MC_2$$

This expression is left in terms of shifts in $MR_1$ and $MC_1$ rather than $MR_2$ and $MC_2$ because of the complexity of the expression if written in terms of shifts in firm 2's curves. The results are not changed in any manner.

Since the corporation equates $MR_2 = MR_1 = MC_1 = MC_2$ in maximizing profits and $AR_2$ at least equals $MR_2$ it must also follow that both $AR_2-MR_1$ and $AR_2-MC_1$ are greater than or equal to zero. Therefore when firm 1 has the higher tax rate the ad valorem tax effects contract trade and where firm 2 has the higher rate trade expands because the corporation is setting a high transfer price that allocates all trade profit to the exporter. The ad valorem tariff effects are trade contracting due to the high transfer price and consequent tariff costs. Therefore, if firm 1 has the higher rate the ad valorem effects reinforce one another but if firm 2 has the higher rate we must compare $rAR_2$ with

$$\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_2-MR_1].$$ If the ad valorem tariff effect is stronger trade contracts while if the tax effect dominates trade expands. This result also holds for transfer prices based on $AR_1$ where the importing firm faces the higher tax rate.

In terms of the effects of setting $Pm_2$ equal to $AR_2$ on export profits, firm 1 pays taxes on export profits of $t_1(P_2 - AC_1)M_2$ to government 1. Firm 2 declares losses on imports since trade costs are $(1 + r)P_2M_2$ while trade revenues are $P_2M_2$. Assuming these losses are deductible from other income firm 2's tax and tariff import costs equal $[(t_2+bt_1-c)(P_2-P_2) + r(1-t_2-bt_1+c)P_2]M_2$. Therefore the importer pays no taxes on import profits and effective tariff costs are reduced by one minus the actual tax rate.

Since the $Pm_2 - M_2$ relationship is negative, expanding trade allocates more profits to the importer and less to the exporter. The rotation tax effect therefore expands trade when firm 1 has the higher tax rate and contracts trade where firm 2 has the higher rate. The rotation tariff effect expands trade since trade expansion lowers the transfer price and therefore tariff costs. Where firm 2 has the higher rate the rotation effects are contradictory so we must compare r with $(t_1-t_2-bt_1+c)/(1-t_2-bt_1+c)$ to determine the net effect.

Table VI.5

Trade Effects Where $Pm_2$ Equals $AR_2$

| Trade Effects | Firm 1 has higher tax rate | Firm 2 has higher tax rate | Actual tax rates are equal |
|---|---|---|---|
| ad valorem | | | |
| tax | contracts | expands | no change |
| tariff | contracts | contracts | contracts |
| rotation | | | |
| tax | expands | contracts | no change |
| tariff | expands | expands | expands |

All three cases appear ambiguous if the transfer price is based on $AR_2$.

Profit Maximization Where $Pm_2$ is Based on $AC_2$

The profit maximizing condition is:

$$MR_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MR_1-AC_2] + rAC_2 = MC_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MC_1-AC_2] + rAC_2 -$$

$$[\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]M_2\frac{dAC_2}{dX_2} = MR_2 = MC_2$$

Again for ease of analysis the condition has been expressed in terms of shifts in firm 1's marginal cost and revenue curves rather than those of firm 2. The results are unchanged.

The ad valorem tax effects expand trade when firm 1 has the high tax rate and contract trade when the importer faces the higher rate because the transfer price is a low price that allocates most profits to the importer. (That is, since the corporation equates $MR_1 = MC_1 = MC_2 = MR_2$ and $MC_2 \geqslant AC_2$ it must also follow that $MR_1 \geqslant AC_2$ and $MC_1 \geqslant AC_2$.) The ad valorem tariff effect contracts trade since trade expansion raises tariff costs. Where firm 2 is the high tax firm the ad valorem effects reinforce one another but where firm 1 is the high tax firm the effects are offsetting. By comparing $rAC_2$ with

$$\frac{t_1 - t_2 - bt_1 + c}{1 - t_2 - bt_1 + c}[MC_1 - AC_2]$$ the net ad valorem effect can be determined.

If the transfer price is based on $AC_2$, firm 1 pays taxes on trade profits of $t_1(AC_2 - AC_1)M_2$ while firm 2 pays tax and tariff costs of $[(t_2 + bt_1 - c)(P_2 - AC_2) + r(1 - t_2 - bt_1 + c)AC_2]M_2$. If firm 1 has the higher tax rate for any given tariff rate the ad valorem tariff effect is stronger (since the effective tariff costs are higher) compared with the case where firm 2 is the high tax firm. The lower tax rate in firm 2 is therefore somewhat offset by the higher effective tariff rate since the tax deduction available for tariff costs is less.

The rotation tax effect expands trade where firm 1 has the higher tax rate and contracts trade where firm 2 has the higher rate since the negative $Pm_2 - M_2$ relationship implies that trade expansion lowers the exporter's trade profits and raises the importer's per unit profits. The rotation tariff effect is trade expanding because expansion

lowers tariff costs. When firm 2 has the higher rate of tax the net rotation effect depends on the relative strengths of the tax and tariff effects, or on whether $r \gtreqless \dfrac{t_1 - t_2 - bt_1 + c}{1 - t_2 - bt_1 + c}$ .

Tabel VI.6

Trade Effects Where $Pm_2$ Equals $AC_2$

| Trade Effects | Firm 1 has higher tax rate | Firm 2 has higher tax rate | Actual tax rates are equal |
|---|---|---|---|
| ad valorem | | | |
| tax | expands | contracts | no change |
| tariff | contracts | contracts | contracts |
| rotation | | | |
| tax | expands | contracts | no change |
| tariff | expands | expands | expands |

If the tax effects are stronger than the tariff effects, where firm 1 is the high tax firm there is a net trade expansion, and where firm 2 is the high tax firm, a net trade contraction. Where tax rates are equal the result is ambiguous since the tariff effects are contradictory.

Summary

The purpose of this chapter is to determine whether or not unambiguous trade results can be generated if the MNE faces both taxes and a tariff. Some unambiguous results are predicted by the model; some probable results are also predicted while the remaining cases remain ambiguous.

The unambiguous results are all trade contracting and assume either fixed transfer prices or prices implying a positive export price-volume relationship. The unambiguous trade contraction cases are:

1. If a fixed transfer price is used and $t_1$ equals $t_2 + bt_1 - c$ there is no tax advantage to be gained from reallocating output or sales. The tariff effect, however, remains to contract trade and the higher is $Pm_2$, the stronger the contracting effect.

2. If a low fixed transfer price applies and $t_1$ exceeds $t_2 + bt_1 - c$ the net tax effect (ad valorem tax compared with specific tax) is trade contracting. This is reinforced by the tariff.

3. If a high fixed $Pm_2$ is set and firm 2's actual tax rate is higher the net tax effect and the tariff effects both contract trade.

4. If an equilibrium $Pm_2$ applies (that is, the transfer price equals $MC_1$ under free trade) the tax effects offset one another so that only the tariff effects remain to contract trade regardless of the tax differential.

5. If a variable transfer pricing policy based on $AR_1$ is used and $t_1$ either equals or exceeds $t_2 + bt_1 - c$ trade contracts. If the tax rates are equal there are no tax effects while if firm 1 has the higher rate, all four effects contract trade.

6. Under a transfer price based on $AC_1$ trade contracts if firm 2's tax rate exceeds or equals firm 1's actual rate and if domestic sales of $Y_1$ exceed zero (in the first case).

7. A variable transfer price based on $MC_1$ causes trade contraction if $t_1$ equals or exceeds $t_2 - bt_1 - c$.

A few cases generate probable but not certain trade results. These are cases where three out of the four effects cause the same

direction of trade movement. Trade probably contracts if firm 1 is
the higher taxed firm and $Pm_2$ is based on $AC_1$ or if firm 2 is the higher
taxed firm and $Pm_2$ is based on $AC_2$. Trade probably expands where firm 1
has the higher tax rate and $Pm_2$ is based on $AC_2$. The remaining cases
generate results that depend on the relative strengths of two effects.
First, where the ad valorem tax and tariff results differ we must compare

$rPm_2$ with $\dfrac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MR_1-Pm_2]$. Second, where the rotation tax and

tariff effects (or the specific effects) differ we must compare r with

$$\dfrac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} \ .$$

## The Horst Analysis

An article by Thomas Horst, "The Theory of the Multinational
Firm: Optimal Behaviour Under Different Tariff and Tax Rates,"[1] was
one of the theories about multinational corporate behavior that provided
inspiration for this dissertation. His paper examines the case of two
related firms engaged in intrafirm trade under tariff and tax barriers.
The analysis is divided into four sections as determined by combinations
of the assumptions of unconstrained pricing versus constrained pricing
and increasing costs versus decreasing costs. This dissertation is based
on one of these cases--the case where the corporation is free to set $P_1$
and $P_2$ without constraint and where marginal production costs of both
firms are positive functions of output. Horst analyses the behavior of
the MNE when faced by taxes on firm 1's pure profits of $t_1$ percent, on

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1. Thomas Horst, "The Theory of the Multinational Firm: Optimal Behaviour
   Under Different Tariff and Tax Rates," _Journal of Political Economy_,
   Sept.-Oct., 1972.

firm 2's profits of $t_2$ percent and by a tariff of $r_2$ percent on exports from firm 1 to firm 2. Since this is also the question addressed in this chapter it is relevant to compare the results presented in the Horst article with those presented here.

Horst assumes the goal of the corporation is to maximize E where: $E = (1-t_1)(R_1-C_1) + (1-t_2)(R_2-C_2) + [(t_2-t_1) - (1-t_2)r_2]TTM^2$ and $R_i$ is the domestic price; TT is the transfer price; M is the volume of exports; and $t_2$ represents the total tax rate on firm 2's profits (represented in this dissertation by $t_2+bt_1-c$). That is, the expression Horst seeks to maximize is identical to that shown in Appendix VI.1. He gives three profit maximizing conditions as solutions to this expression:

1) $MR_1 = MC_1$  2) $MR_2 = MC_2$  3) $(1-t_1)MC_1 = (1-t_2)MC_2 + [(t_2-t_1) - (1-t_2)r_2]TT^3$

Horst considers only fixed transfer prices and therefore ignores the complications associated with variable pricing. (This becomes important later.) One condition is missing from the three presented above: $(1-t_1)MR_1 = (1-t_2)MR_2 + [(t_2-t_1) - r_2(1-t_2)]TT$. It is implied by his conditions but should be stated. The corporation allocates its output by equating the two marginal costs adjusted for taxes and transfer price effects. It also allocates its domestic sales by equating the marginal revenues adjusted for taxes and transfer price effects. All four conditions for a profit maximum are contained in the single condition presented in Appendix VI.1. This concentration by Horst on the allocation of output is next revealed when, after examining the profit maximizing conditions, Horst concludes that: "A mixed strategy of

2.  T. Horst, p. 1061.
3.  T. Horst, p. 1069.

producing in both countries and exporting between the two could well be optimal--the exporting country being the one with lower marginal cost at the no-trade position.  The direction of trade will thus reflect a cost advantage."[4]  As we have seen in Chapter II intrafirm trade reflects a cost advantage and a revenue advantage.  Trade flows from the low cost-low revenue firm to the high cost-high revenue firm because the MNE through trade can shift output to the low cost firm and sales to the high revenue market and therefore increase total profits.

Horst concludes "a higher tariff, by raising the firm's import costs, is certain to discourage imports, encourage local production, and raise prices in the importing country."[5]  This conclusion is supported in Chapter III for fixed and variable transfer prices with positive $Pm_2 - M_2$ relationships.  However, a variable price such as $AR_2$ or $AC_2$ with a negative $Pm_2 - M_2$ relationship that expands trade by reducing the tariff as trade expands can outweigh the initial effect of export contraction and cause a net trade expansion.  Since Horst ignores variable transfer prices this complication does not arise in his analysis.

The importance of distinguishing between fixed and variable transfer prices is again revealed in Horst's discussion of taxation and tariffs.  He says "As long as the tax rate differential, T, (ie. $t_2 - t_1/1 - t_2$) is less than the tariff, $r_2$, and the firm is induced to set its transfer price, TT, equal to the marginal cost of production, $MC_1$, ---------minor changes in any tax rate are likely to have no effect on the firm's behaviour."[6]  First note that his differential is the negative

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4.  T. Horst, p. 1064.
5.  T. Horst, p. 1064.
6.  T. Horst, p. 1064.

of what this chapter defined as the 'tax differential divided by the after tax return to firm 2 or $(t_1-t_2-bt_1+c)/(1-t_2-bt_1+c)$. That is, Horst is saying when firm 1 has the higher tax rate or the difference between the two tax rates is minimal and the firm sets $Pm_2$ equal to $MC_1$ the tariff effect dominates. Referring to Table VI.1 we see a summary of the trade effects when the transfer price is fixed. If firm 1 has the higher tax rate the ad valorem effects expand trade while both specific effects contract trade. Choosing the special transfer price, $MC_1$, the marginal cost of production in the pre-trade-barriers situation, implies that the ad valorem and specific tax effects cancel. The marginal profit on exports is zero, as it is on domestic sales, and therefore taxes cannot be reduced by reallocating export and domestic sales. The MNE does not alter its behavior and corporate profits fall by the tax. This is true whether firm 1 has the higher tax rate; firm 2 has the higher rate; or the tax rates are equal. Since there is no net tax effect the tariff effect must dominate and trade contract when $Pm_2$ equals that particular level of $MC_1$. Horst fails to understand the special nature of pricing at marginal cost. In order for the tariff effect to dominate and the tax effects to disappear the transfer price must be the fixed $Pm_2$ set equal to the marginal cost of firm 1's output in the no-trade-barrier situation. For any other fixed transfer price or level of $MC_1$ the tax effects remain; as they do when variable marginal cost pricing is used. Referring to Table VI.4 , we see that the ad valorem tax effects are zero. However, as trade expands or contracts the transfer price rises or falls, respectively causing a rotation effect. When firm 1 has the higher rate the rotation effect tends to contract trade while when firm 2 has the higher rate the effect tends to expand trade.

Changing the transfer price as the volume of trade changes alters the marginal trade profit since under variable pricing the average revenue and marginal revenue from exports are not equal. Setting $Pm_2$ equal to $MC_1$ implies a positive export price-volume demand relationship. If the demand for $M_2$ curve is upward-sloping the marginal revenue from exports must lie above the average revenue from exports and therefore positive marginal profits are made on exports. Since zero marginal profits are declared on domestic sales, if firm 1 has the higher tax rate the MNE contracts trade and expands sales of $Y_1$ in order to reduce total taxes; wheras, if firm 2 has the higher rate the corporation expands trade. As variable transfer prices such as $MC_2$ imply a negative $Pm_2 - M_2$ demand relationship where marginal export revenue lies below average export revenue. If firm 1 has the higher rate this expands trade, since marginal export profits are negative, and if firm 2 has the higher rate, trade contracts. In summary, marginal cost pricing can have complicated, but predictable results. Unless a fixed transfer price, set equal to the level of $MC_1$ (or equal to $MC_2 = MR_1 = MR_2$, for that matter) in the free trade situation is used Horst's comment that "A high tariff policy -------has the unfortunate side effect of rendering tax policy impotent"[7] is completely inaccurate and misleading. The net tax effect is zero only in this special case or if the tax differential is zero. In general, the tax differential has a strong effect on the behavior on the MNE. It is, however, true that in this one special case the tax proceeds of the governments involved are maximized since the MNE does not react to the tax differential. To the extent that the corporation sets its transfer prices on the basis of current marginal costs and alters them as output changes, tax policy does have a role to play.

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7. T. Horst, p. 1068.

The remainder of the Horst article deals with assumptions that are not made in this dissertation and therefore no comments are made here. In summary, Horst has provided a concise article that contains most of the relevant results. His stress on fixed transfer prices, however, and on $MC_1$ in particular, leads him to ignore important complications in the analysis and results in his erroneous conclusion that tax policy is impotent in the face of high tariffs.

## Conclusions

When the behaviour of the multinational enterprise is constrained by profits taxes the MNE reacts so as to minimize its total tax bill. If the exporter's tax rate is higher the corporation shifts trade profits to the importer via lower transfer prices and/or trade expansion. If the importer has the higher tax rate the MNE sets a high price and/or contracts trade. The tariff complicates this reaction since a transfer price that minimizes taxes can result in high tariff costs. The corporation must take tariff costs into account in maximizing after-tax profits.

Depending on the tax differential, the transfer price, the tariff rate and on the sign of the export price-volume relationship the MNE will react to tax and tariff barriers by trade expansion, contraction or reversal. In a few cases, given data concerning these factors we can predict that trade flows unambiguously contract. In others, trade is likely to contract while in the remainder the final result depends on the precise values of the variables concerned. The Horst analysis, by restricting itself to fixed transfer prices, ignores some of the more interesting problems and results that the model generates and

wrongly concludes that tax policy is impotent in the face of high tariffs.
This chapter clearly demonstrates that both tax and tariff policies
affect the behavior of the multinational enterprise.

Chapter VII

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.

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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 Divi-
   sional 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, $\Sigma NMR$, 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 VIII.1
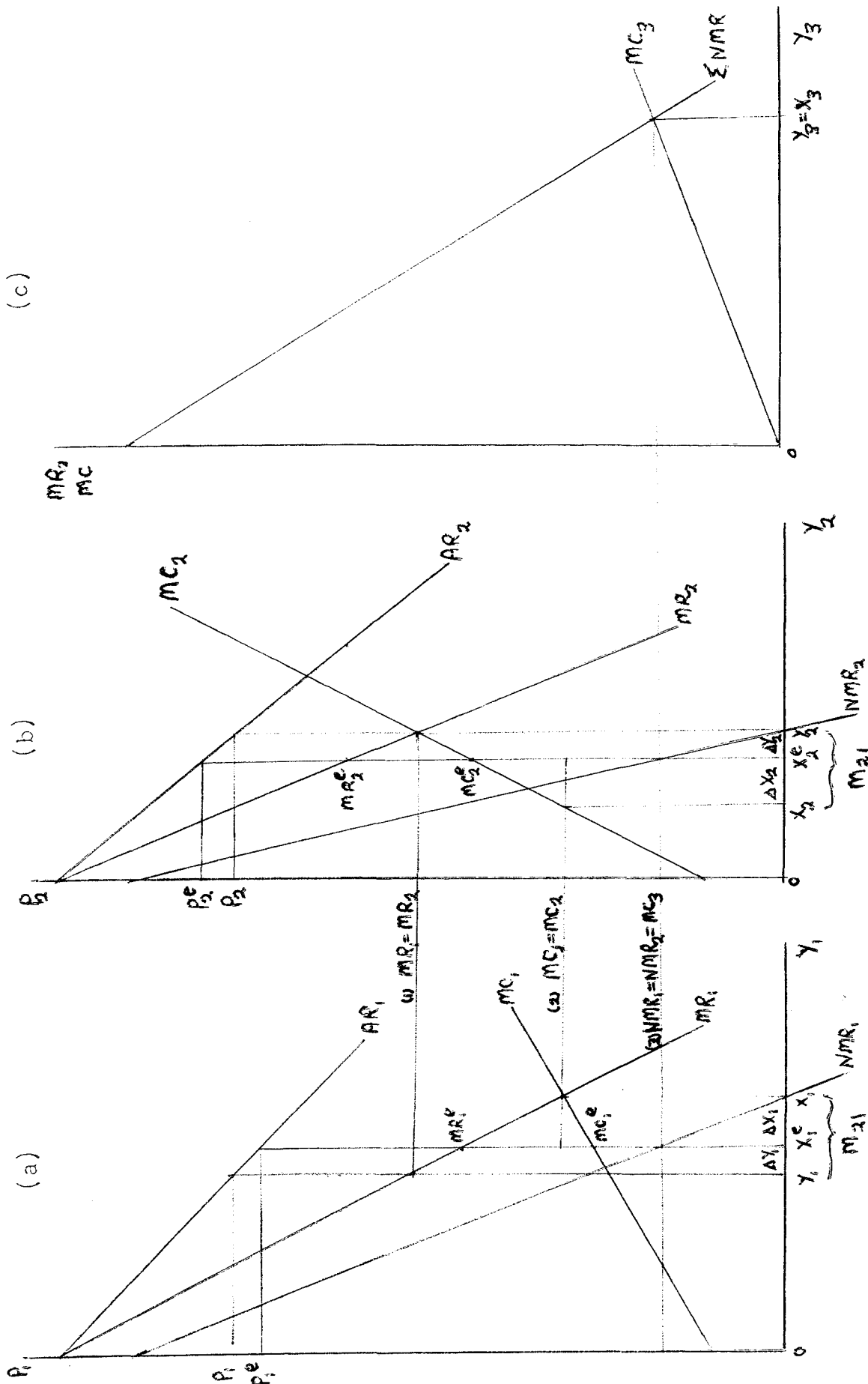
Profit Maximization in the Vertical Integration Model Under Free Trade

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.

<div align="center">

Profit Maximization When Country 2

Levies a Tariff on Unfinished Imports

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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 $\Sigma NMR$ curve shifts to the left, causing

236.

Figure VII.2

Profit Maximization with a Tariff on Finished Imports
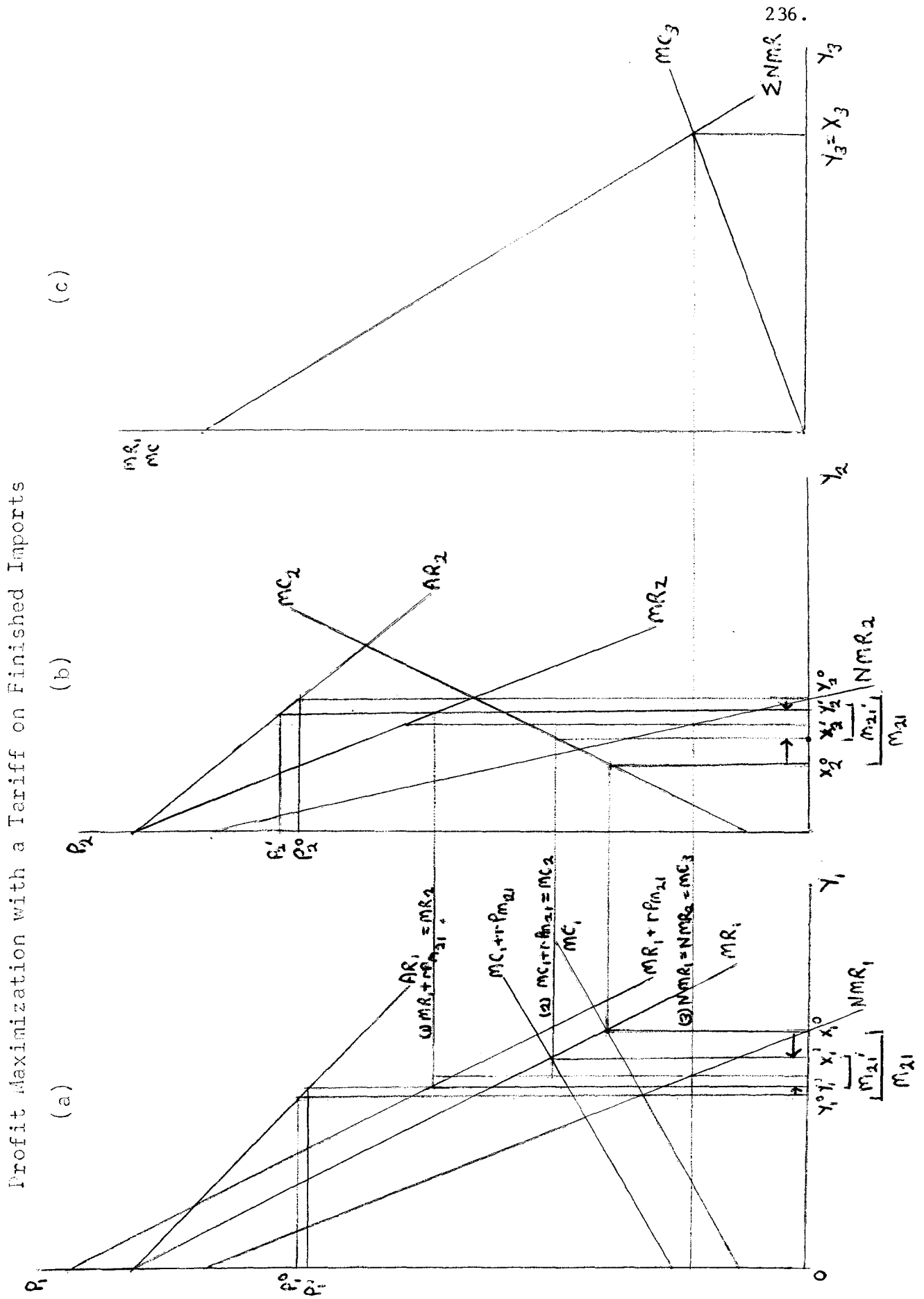
a fall in $MC_3$ and $X_3$. The tariff raises the cost of intermediate goods

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 $\Sigma NMR^1$ 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
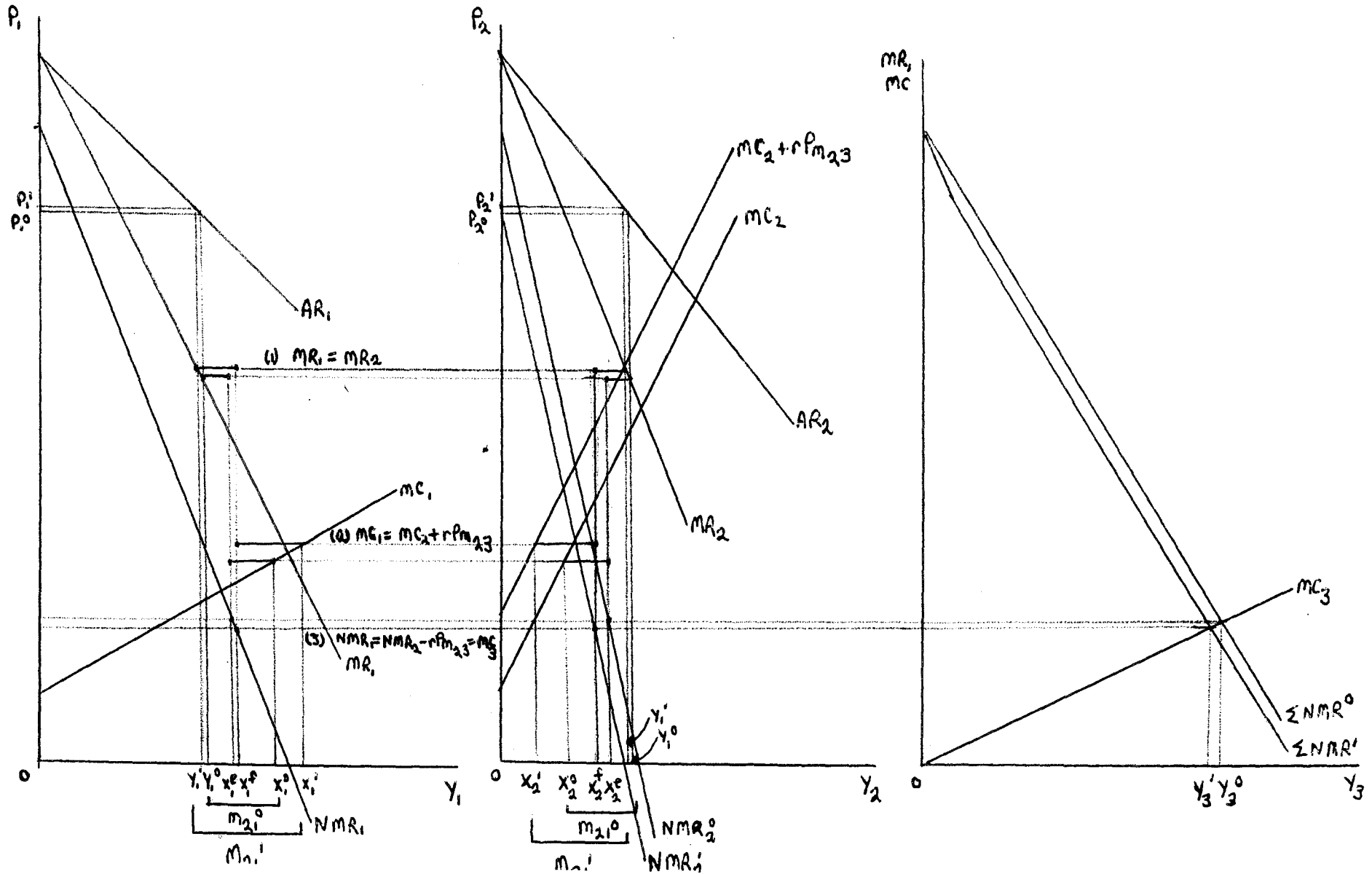
$Y_1^o$ to $Y_1^1$ and a fall in $Y_2$ from $Y_2^o$ to $Y_2^1$. The MNE also equates $MC_1$ = $MC_2 + rPm_{23}$ causing a fall in $X_2$ from $X_2^o$ to $X_2^1$ and a rise in $X_1$ from $X_1^o$ to $X_1^1$. Consumers in both countries face higher prices as a result of the tariff. The tariff revenue paid 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 con- flicting 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

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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 progres-
sive.  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.

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The Residence Principle Applies While Firm 2

is a Branch and Firm 3 is a Subsidiary

</div>

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

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 inter-

mediate 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.

Chapter VIII

Conclusions

Summary of Main Conclusions by Chapter

Chapter I

Two important departures from traditional approaches to multinational enterprises are made in this dissertation: an emphasis on a microeconomic approach to MNE behavior, and a concentration on intrafirm trade as an often-overlooked facet of the direct investment process. By building a model of multinational behavior where the MNE is assumed to 1) maximize total profits; 2) hire all of its labor and capital in perfectly competitive markets; 3) own a unique factor of production, technology, on which monopoly rents can be earned; and 4) price discriminate between markets, one can analyze the responses of the MNE to various governmental constraints. By relaxing these assumptions, such as perfectly elastic factor supply or price discrimination, one can generate more complicated results that in themselves could become broader topics of study. The basic assumptions made here, however, do permit handling of the problem in a relatively simple fashion and may not be too far removed from actual experience to serve as useful insights into multinational behavior.

The dissertation stresses that the explanation of the volume of trade flows as compared to the value of trade flows must be carefully distinguished where the firms engaging in trade are related firms. If the firms are unrelated comparative advantage can be used to explain both the volume and value of trade patterns. With MNE trade the volume patterns can also be explained by cost and revenue differentials but the value of trade flows will in general, be determined by completely

different forces. Since the prices charged in transactions between related firms, the transfer prices, are internal accounting prices within the corporation they will be determined with regard to maximizing total corporate profits and providing a method of control over subsidiaries and branches of the MNE. The forces affecting the Balance of Payments between countries will therefore differ depending on whether international trade flows are between related or unrelated firms.

## Chapter II

Previous writers on multinationals stressed the benefits and costs to home and host countries of the direct investment process. One explanation of direct investment is that the MNE possesses a scarce factor, technology, on which it can earn monopoly rents by producing abroad. This scarce factor is the key to the direct investment process. The concept of a scarce factor has been extended in this dissertation to include a justification for intrafirm trade. If the multinational does own a specialized factor not only direct investment but generally intrafirm trade is required as a necessary condition for maximizing rents on the technology. Where marginal costs and revenues differ between related firms profits will only be maximized if the firms engage in trade since through trade the MNE can shift output to the low cost plant and shift sales to the high revenue market. Therefore cost and revenue differentials (that is, comparative advantages) provide a rationale for intrafirm trade; the volume of trade flowing from the low cost-low revenue firm to the high cost-high revenue firm. One result of this trade is that it is "efficient" in the sense that any given total output of the MNE is produced at minimum cost.

Under free trade, then, the direction of trade (volume) flows between related firms is determined by cost and revenue factors as is trade between unrelated firms. The transfer price charged in these transactions cannot affect MNE behavior since the transfer price under free trade determines the distribution of trade profits between firms but does not affect total profits. Where external constraints such as tariffs and tax differentials are imposed on the MNE its response depends on whether or not the transfer price is constrained. If the MNE is free to set its transfer pricing policy it will generally alter these prices so as to minimize the external costs imposed on it. If the MNE is constrained to follow a particular pricing policy, either due to government regulation or internal control constraints, it will react to trade barriers by altering resource allocation decisions, trade flows, dividend remittance rates, interest payments, et cetera. The resulting changes in trade flows, output and sales allocations, and prices will depend on whether the transfer price is "high" (above marginal cost of the volume of exports under free trade, $MC_1$), "low" (below $MC_1$ under free trade), or "equilibrium" (equal to $MC_1$ under free trade). In addition, the changes will depend on whether the transfer price is fixed or variable. This distinction between fixed and variable prices does not appear to have been made elsewhere and it yields some interesting results. Although price changes in the real world are not as frequent or small as those posited by a continuous export price-volume relationship the assumption of variable transfer prices yields some useful insights into corporate responses to external constraints.

The model developed in this thesis also breaks new ground by detailing the effects of MNE behavior on factor markets. Some work on product markets (Horst,[1] Copithorne[2]) has been done but no micro-economic model of factor market changes induced by constraints on the multinational is available. Generally, perfectly competitive factor markets are assumed but comments on imperfectly elastic factor supply responses to the resource allocation decisions of the MNE are included. By including factor markets in the model one can compare the standard international trade factor market theorems with the responses predicted here.

The whole argument of the gains from trade is reexamined from the viewpoint of multinational trade. The first best argument for free trade, that both countries move outside their production possibility frontiers and reach higher levels of economic welfare, does not necessarily hold for intrafirm trade. In the pretrade situation monopoly in product markets causes an initial welfare loss in that marginal rates of substitution (MRS) exceed marginal rates of transfor-mation (MRT) in each country. When trade opens up the MRT of both countries are brought into equality so that global efficiency is increased by intrafirm trade. If price discrimination between countries is not possible the MRS of both countries are also equalized but since equalized MRS still exceed equalized MRT the loss in welfare due to the MNE persists. The country exporting the good with the lower elasticity of demand gains while the country exporting the good with the higher elasticity of demand suffers a loss of welfare. If price discrimination is possible an additional welfare burden is imposed since MRS are not

1. Thomas Horst, 1972.
2. L. W. Copithorne, 1971.

equalized between countries. Therefore the terms of trade argument
for free trade holds on efficiency grounds but not on equity grounds
when intrafirm trade is involved.

The second best arguments for free trade are based on the
gains to different groups as a result of free trade. Under free intra-
firm trade the groups affected are the related firms, the factors
employed by these producers, and the consumers of the product of the
MNE. Intrafirm trade unambiguously raises total producer profits if
there are cost and revenue differentials in the pretrade situation.
While total profits are increased by free trade the division of profits
depends on the transfer price charged on trade flows. A low transfer
price allocates most trade profits to the importer while a high transfer
price shifts profits to the exporter. The gains to factors and consumers
from intrafirm trade are, however, ambiguous. Consumers in the importing
country gain since prices decline while consumers in the exporting
country suffer a loss in consumer surplus. While the division of the
gains is therefore predictable the net impact on the whole group is
not. Similarly the division of factor gains is predictable while the
total effect is not. If factors are perfectly elastically supplied
to the producers intrafirm trade does not affect factor incomes in each
country. If the MNE can affect factor prices the intensive factor
in the expanding firm gains absolutely and relatively compared to other
factors employed by that firm while the intensive factor in the contracting
industry suffers an absolute and relative loss. The opening of trade
also causes the marginal products of capital to be equated in the two
firms since capital is mobile across national borders.

The thesis also expands the discussion of group gains from intrafirm trade into a discussion of the effects on the national and domestic income of both countries and on the Balance of Payments between them. Domestic and national income are distinguished since residence of factors and of profit flows is important for national income. The Balance of Payments is affected in this context by commodity, profit and capital flows.

## Chapter III

Because output and sales allocation patterns and transfer pricing policies of multinationals determine the distribution of the gains from trade among the countries where multinationals operate, the governments of these countries have attempted to redistribute these gains in their own favor through trade barriers. The most common of trade barriers is the tariff. The standard argument in favor of tariffs is that the country levying the tariff can raise domestic production of the protected industry, lower imports, and purchase these imports at lower cost if the country can affect its terms of trade and the other countries do not retaliate. Under intrafirm trade the effects of a tariff depend on whether the transfer price is fixed or variable. A fixed transfer price has the standard results--imports decline, domestic output of the protected industry rises, the terms of trade turn in favor of the country levying the tariff. With a variable transfer price it is possible that the exact opposite may occur; that is, trade expansion, smaller domestic output and a worsening of the terms of trade. If the transfer price falls as the volume of trade rises (as it does in cases where the transfer price is based on average costs or revenues of

the importing firm) the MNE will attempt to reduce tariff costs by expanding trade. This "rotation effect" may or may not be outweighed by the "ad valorem effects" of the tariff inducing trade contraction. The possibility remains that the traditional argument for tariff protection may not hold under intrafirm trade. It is also useful to note that many governments now require that transfer prices be based on "fair market value." If this is fair market value in the country of export trade unambiguously declines for both fixed and variable transfer prices since the high transfer price contracting trade is rein-forced by the positive export price-volume relationship. If, however, it is fair market value in the country of import a variable transfer pricing policy may cause trade expansion and less protection to the domestic industry.

Under free trade the MNE produces its output at lowest cost. The tariff induces a distortion into these resource allocation patterns that generally (except in the variable case noted above) causes output expansion in the high cost plant; sales expansion in the low revenue market; and a fall in trade flows. By reacting to minimize tariff costs the MNE incurs two excess burdens of higher production costs and lower revenues. However, the actual tariff costs plus the two excess burden expenses must be less, in total, than the tariff revenues that the MNE would have paid on the initial trade flows. Total profits fall by more than actual tariff costs but the new distribution of the MNE profits is uncertain. Profits on domestic sales of the exporter and on domestic production of the importer increase but trade profits decline. The distribution of the smaller trade profits plus the tariff costs affects the division of profits between the two firms. The tariff,

by inducing changes in trade flows and output and sales patterns, also

affects the consumer and factor gains from trade.  Consumers of the

product of the contracting firm gain consumer surplus since prices

decline while consumers of the expanding firms domestic sales suffer

losses.  In perfectly competitive factor markets the tariff, by driving

a wedge between the marginal revenues of the two firms, causes marginal

factor productivities to diverge.  Under free trade the marginal

productivity of capital was everywhere the same while under a tariff

these productivities differ since the MNE takes factor prices as given.

If factor prices can be affected changes in factor incomes occur depending

on supply elasticities and changes in trade flows.  In addition to

changes in group gains the tariff induces changes in domestic and

national incomes of the countries involved and in their trade balances.

Generally the trade balance of the exporting country suffers as exports

decline and remitted profits fall unless these are offset by increased

inflows of capital earnings.


## Chapter IV


The MNE determines its resource allocation patterns not only

in response to tariffs but also to corporate income tax rates levied

on the profits of its related firms.  In this sense multinationals

differ from large national firms who face only the external constraint

of tariff barriers since tax rates are assumed uniform within countries.

Under MNE trade both corporate income taxes and tariffs are barriers

to trade.  This is a crucial difference often missed by writers who

equate removal of tariff barriers with free trade.  By assuming the

corporation hires all of its capital the corporate income tax can be

reduced to a tax on pure profits; that is, a tax on the monopoly rents earned on the scarce factor owned by the MNE. A pure profits tax on monopoly profits is usually held to be neutral in that the monopolist absorbs all of the tax, passing none of the tax incidence to consumers or factors. The case of a neutral profits tax can only be applied to the MNE under special circumstances. Usually, the profits tax is nonneutral; alters the location of factor employment and disturbs international commodity flows; that is, the profits tax is globally inefficient.

This chapter assumes that the home country levies a tax on pure profits of the MNE. If it taxes on source rules only profits of the domestic firm are taxed; if it taxes on residence-branch rules both firms are taxed at the same rate; and if residence-subsidiary rules apply only remitted foreign profits and domestic profits are taxable. By letting "b" (o $\leq$ b $\leq$ 1) stand for the fraction of the foreign firm's profits legally taxable (not actually taxed since these may differ) in the home country, the effects of the tax on the MNE can be reduced to dependence on two factors: the tax differential (t − bt) between the two firms, and the transfer pricing policy of the MNE.

With a fixed transfer price there are two conflicting factors influencing multinational behavior. First, if the tax differential is positive, the MNE has an incentive to shift profits to the foreign firm where they face a lower rate of tax. If the domestic firm is the exporter these ad valorem effects therefore are trade expanding. Second, the higher the transfer price charged by the domestic firm for exports to the foreign firm, the greater the share of trade profits allocated to the exporter and the larger taxes paid to the domestic government.

These specific effects are therefore trade contracting. If a high
transfer price is set the specific effects dominate the ad valorem
effects and trade declines. A low transfer price similarly causes
trade expansion while an equilibrium transfer price generates no changes
in trade flows and is globally efficient. If there is no tax differential
(that is, residence-branch rules apply) all profits are taxed at the
same rate wherever earned; the total tax incidence falls on the MNE;
and again the tax is globally efficient. Raising the domestic tax
rate or increasing the tax differential by lowering the rate of remit-
tance, causes larger trade flows, ceteris paribus, and is therefore
less neutral.

With a variable transfer price the ad valorem effects measure
the impact of the tax differential on marginal revenue minus the transfer
price and on marginal cost minus the transfer price. With a high transfer
price and positive tax differential the ad valorem effects are trade
contracting since most trade profits are allocated to the high taxed
exporter. A low transfer price is trade expanding since it shifts profits
to the importer. And the equilibrium transfer price has no net ad valorem
effects since the benefit of shifting profits to the foreign firm is
just offset by the higher home taxes on the transfer price. The tax
has a second effect with a variable transfer price in that changes in
trade flows cause changes in the export price and therefore affect the
per unit distribution of trade profits between the two firms. A positive
export price-volume relationship is trade contracting while a negative
relationship is trade expanding. These ad valorem and rotation effects
may complement or conflict with one another. Generally, the ad valorem
effects dominate so that the net result is predictable. Again, if

residence-branch rules apply the rotation effect disappears since there is no tax differential to induce changes in trade flows.

Since the profits tax applies to two-way trade flows it can cause trade expansion, contraction, cessation, or reversal. The effects on output and sales allocation, prices, factor hiring, the gains from trade, national and domestic income, and in the Balance of Payments, all depend on the change in trade flows induced by the tax. The effect on resource allocation and on factor hiring and factor productivities depend therefore on the tax differential and the transfer price. Where the tax is nonneutral producer profits fall by more than actual tax costs due to resource distortions. Actual costs must be less than the tax costs that would have been paid if the full tax incidence had fallen on the MNE (that is, in the residence-branch case or if a fixed equilibrium transfer pricing policy is followed). The division of producer after-tax gains is ambiguous. Changes in consumer and factor gains from trade depend on changes in trade flows induced by nonneutral tax. Nonneutrality also induces changes in domestic and national incomes and in the Balance of Payments.

## Chapter V

When both governments levy pure profit taxes on the MNE the analysis is complicated by the fact that the tax differential can now be positive or negative. Under source rules each government taxes only domestic profits so that no double taxation occurs while under residence rules both governments tax the profits of the branch or subsidiary. Unless the home government grants full tax relief for foreign taxes paid on foreign profits some degree of excess taxation

occurs to induce distortions. The chapter discusses the effects of four possible kinds of tax relief symbolized by "c": no tax relief, deduction, regular credit and LDC credit. The tax differential now depends on the form of tax relief granted by the home government since it is the actual differential $(t_1-t_2-bt_1+c)$ rather than the stated differential $(t_1-t_2)$ that influences MNE behavior. Given the actual tax differential the multinational's response will depend on the transfer price, whether high or low, fixed or variable.

If no tax relief or deduction of the foreign tax is allowed some degree of double taxation occurs. The direction of trade flows induced by the tax is therefore the same under these forms of tax relief although the change in trade flows is smaller under deduction rules since the degree of double taxation is less. Similarly both regular and LDC credit cause the same direction of change in trade flows (with one exception) but the volume of change is smaller with the regular credit since the tax differential is smaller.

Total tax revenues received by both governments are maximized if the full tax incidence falls on the MNE. This is most likely to occur under the regular credit method since it yields the smallest tax differentials of all four forms of tax relief. Taxes are also maximized if an equilibrium fixed transfer price is used because since marginal export profits equal marginal domestic sales profits equal zero the MNE gains no tax saving by shifting profits from exports to domestic use or vice versa. In summary, the tax structure is globally efficient if: 1) $t_1 = t_2$ and source rules apply, 2) $t_1 = t_2$ and regular or LDC credit rules apply for all $0 \le b \le 1$, 3) $t_1$ exceeds $t_2$ and b = $\dfrac{t_1-t_2}{t_1}$ under no relief; b = $\dfrac{t_1-t_2}{t_1-t_1t_2}$ under deduction; and b = 1 under

regular credit; 4) $t_2$ exceeds $t_1$, b = 1 and the home government grants full refund; 5) the MNE applies a transfer price fixed at the level of marginal export cost under free trade.

If full neutrality is achieved no changes in resource allocation, prices or factor incomes occur. However, internation equity is affected since the foreign government through taxation captures part of the home government's national profits. In this manner the host government can redistribute the gains from trade in its favor without affecting global efficiency. If the taxes are nonneutral further changes in internation equity occur as the taxes induce changes in consumer surplus and in factor incomes.

## Chapter VI

When both profit taxes and tariffs constrain the MNE the two forms of trade barriers can reinforce or conflict with one another. For example, a tax differential inducing trade contraction will generally (with the variable pricing exception previously noted) be reinforced by a tariff on imports so that trade volume unambiguously declines. Where the tax and trade effects conflict the MNE weighs one against the other. If the tax differential is zero or a fixed equilibrium transfer price applies tax policy is impotent and only the tariff effect remains. In all other cases tax policy has an important role in influencing multinational behavior.

## Chapter VII

The basic model developed in this thesis assumes intrafirm trade occurs between horizontally integrated secondary manufacturing

firms engaged in selling to consumers in their domestic markets. Intra-firm trade also takes place between nationally integrated firms where a primary firm supplies related secondary firms with intermediate goods. Chapter VII outlines a vertical expansion model demonstrating that the results obtained in the horizontal model apply equally well to vertical intrafirm trade. The MNE in fact has more flexibility to minimize external costs since there are more trade flows and transfer prices involved. Previous writers on vertical integration suggested that MNE profits were maximized where the net marginal revenues of the secondary firms equal the marginal cost of the primary firm. The model in Chapter VII proves that this condition while necessary to determine the total output of the MNE is not sufficient for total profit maximization. In addition, the marginal revenues of the secondary firms must be brought into equality and their marginal costs also equated since as long as cost-revenue differentials persist profits can be increased through intrafirm secondary trade. Under free trade transfer prices do not affect profit maximization but do affect the distribution of profits among the firms.

Tariffs can now apply to primary or secondary trade flows or both. A tariff on secondary trade does not affect total output but does shift the distribution of output and sales between the secondary firms as trade (with fixed transfer prices) contracts. A tariff on primary imports causes total output to decline and reduced production in the importing firm protected by the tariff. The tariff also induces increased secondary exports to the contracting firm to replace domestic production.

The model only outlines taxation by the home country of MNE
profits.  Under source rules only domestic profits are taxed so that
the MNE shifts profits out of the high-taxed firm via low export prices
on its secondary output and high import prices on its primary inputs.
Under residence rules MNE behavior depends on the tax differential and
the transfer price.  Where both foreign firms are branches the total
tax incidence falls on the MNE and global efficiency is not disturbed.
Where the secondary importing firm is a branch the MNE shifts profits
to the primary firm via high transfer prices for primary inputs.  Where
the primary firm is a branch the MNE sets low import transfer prices
to the secondary importer firm.  Where both firms are subsidiaries
the MNE has the greatest scope for tax minimization under residence
rules.

## New Directions

This dissertation is necessarily incomplete.  It attempts to
outline a broad topic; to offer new insights; and to raise questions.
Its incompleteness falls into five areas:  assumptions, the model, a
macroeconomic approach, policy-making, and testing.

The assumptions were made in order to more easily handle
the subject matter but some cost in terms of lack of relevance may
be involved.  If the assumptions are modified different results will
be generated.  The model assumes that firms can price discriminate
between markets.  By assuming prices are constrained by the tariff
(as does Horst[3]) the model generates more complex results.  The model
assumes the related firms are monopolists in their domestic market.

3.  Horst, 1972.

The assumption could be changed to allow oligopolies and to outline

the effects bargaining powers, increasing monopoly power, etc. have

on the economy. The assumption of perfectly elastic factor supply

could be dropped and more careful attention paid to the resulting

factor market changes. Both firms are assumed to face increasing

costs. Assuming decreasing costs leads to different results (see

Horst[4]). The multinational was assumed to hire all of its capital

so that the corporate income tax could be treated as a tax on pure

profits. By allowing the MNE to own capital, direct distortions can

be introduced into the capital market. The model also assumes the goal

of the MNE is to maximize total profits. Other goals, such as satisfic-

ing or maximizing domestic profits at the expense of foreign profits,

are not considered. Transportation costs and nontariff barriers to

trade such as quotas are ignored.

The vertical integration model could be more rigorously

developed since only fixed transfer prices, and home country taxation

are assumed. The gains from trade and the behaviour of factor markets

were not developed. A more regional approach could be taken to include

federal, provincial and local taxes. More emphasis could be placed

on  under and over invoicing  methods and the substitutions between

dividends, interest payments, royalties and transfer payments developed

in more detail.

This is a microeconomic model of MNE behavior and as such it

could be generalized to study how groups of multinationals in a general

equilibrium framework respond to free trade and to trade barriers. The

model could be developed to apply specifically to the less developed

countries.

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4. Horst, 1972.

From a policy viewpoint an indepth study of current govern-
mental regulations and their implications in the light of this model
could be rewarding. The model could be used as a basis for building
an efficient and equitable international tax system. The implications
of the model for labor groups, for the Balance of Payments, and for
joint ventures and rationalization of industries could be outlined.
The United States Section 482 guidelines on transfer pricing and rules
such as "foreign fair market values" need to be reevaluated with respect
to the implications of the model. Some of the policy implications
of international trade theory need to be modified when multinational
trade is involved.

And, finally, this dissertation outlines a theoretical model
that does not include any testing of its predictions. If the data
becomes available (perhaps through the current United Nations study
or through government regulations requiring more disclosure of corporate
information) it should be possible to test the model for one industry
or groups of multinationls. If tax and tariff data, demand and supply
conditions, transfer pricing policies and trade flows are known an
empirical study of the reaction of an MNE to changes in taxes, tariffs,
and transfer pricing regulations could be made. This testing would
first, test the validity of the model, and second, be of use to policy
makers in selecting policy responses to the multinational enterprises
in their midst.

## Conclusions

The basic premise of this dissertation is that multinational
trade does differ from trade between unrelated firms. It differs because

the goal of the related firms is to maximize total profits and because
the price charged in these transactions is an internal accounting
price that can be manipulated by the MNE.  Because intrafirm trade is
different traditional international trade and public finance theorems
may not hold.  Free trade may not maximize global welfare nor bring
unambiguous gains to all parties to the exchange.  Tariffs may cause
trade expansion instead of contraction and injure rather than protect
the import-competing industry.  Fair market value pricing may cause
more market distortions than marginal cost pricing.  For the multi-
national corporate tax differentials are as much a barrier to free
trade as are tariffs.  A pure profits tax will not generally fall
wholly on a monopolist if that monopolist is a multinational firm.
Tax neutrality can be achieved by equating actual tax rates across
countries or by forcing the MNE to set a fixed equilibrium transfer
price.  Regular credit is the most neutral form of tax relief available
at the present time.  If tax neutrality is achieved, internation equity
is affected if the foreign government taxes profits.  If tax neutrality
is not achieved further distortions in internation equity occur.  Where
both taxes and tariffs apply tax policy is not impotent.  Under vertical
integration profit maximization generally requires intrafirm secondary
trade flows.

Left to itself under free trade the multinational enterprise
will allocate its resources so as to produce its output at minimum
cost.  However, the distribution of trade gains that results may not
be equitably divided among the countries participating in that trade.
For this reason governments now impose various trade barriers and
transfer pricing constraints on multinationals.  These uncoordinated

constraints cause market distortions that may actually lower the gains

to all countries compared to the free trade situation.   The greater

the tax differentials and the higher the tariff barriers, <u>ceteris paribus</u>,

the greater the distortions in resource allocation and internation

equity.   If governments could agree on an equitable distribution of

the trade gains a tax structure could be developed that was both neutral

and equitable.   This tax structure might involve a move to residence-

branch rules with regular credit tax relief; or to source rules with

equal stated tax rates; or to regulating transfer prices based on

marginal export costs under free trade.   In addition, global efficiency

would also require that tariff barriers be eliminated.   In summary,

in order to allow the multinational to operate efficiently and to also

equitably distribute trade gains among countries, governments should:

1) reduce tariff barriers to trade;

2) agree on some method to equitably share in the benefits from multi-

national trade; and

3) develop a globally efficient international tax structure and/or

induce transfer pricing at marginal export cost under free trade.

Finally to quote Jack Behrman,

> This, then, is the fundamental challenge of the MPE:   nations,
> in reaching for economic efficiency and growth through this
> enterprise, and in attempting to find solutions to its
> challenge to sovereignty, will have to come to grips (expli-
> citly or implicitly) with the social values underlying
> the international economic system and the principles of
> equity on which it is based.   However  governments decide
> to respond, they will be embarking on an exercise in sharing,
> for which there are no acceptable principles at present....

> The paradox of this challenge is that, in seeking the appro-
> priate principles and methods of implementation, govern-
> ments can have the ready assistance of the MPE itself....
> If it is necessary that national parties share in some
> specified fashion in the benefits of economic integration,

the enterprise can readily arrange its own operations so
that these shares are secured.  Governments will have to
enunciate the principles of sharing, but the enterprise
can translate them into practice.[5]

5.  Jack Behrman, in J. H. Dunning, 1971, p. 301.

Profit Maximization Under Free Trade

## I. Assumptions of Model

$$TT_1 = P_1 Y_1 - C_1 + Pm_2 M_2 - Pm_1 M_1$$

$$TT_2 = P_2 Y_2 - C_2 + Pm_1 M_1 - Pm_2 M_2$$

where $P_i Y_i$ is value of i's domestic sales $P_i = f(Y_i)$ $dPk/dYi < 0$

$C_i$ is i's cost of production $C_i = f(X_i)$ $dCi/dXi > 0$

$Pm_i M_i$ is value of i's imports

$TT_i$ is pure profits of i

$(i = 1, 2)$

$$M_2 = X_1 - Y_1$$

$$M_1 = X_2 - Y_2$$

$$M_1 + M_2 = 0$$

$$TT = TT_1 + TT_2$$

The goal of the corporation is to maximize TT subject to the above constraints.

## II. First Order Conditions for Profit Maximization Under No Trade

If the firms do not engage in trade $Pm_1 = Pm_2 = 0$

$$TT_1 = P_1 Y_1 - C_1$$

$$TT_2 = P_2 Y_2 - C_2$$

where $Y_1 = X_1$ and $Y_2 = X_2$

$$TT = P_1 Y_1 - C_1 + P_2 Y_2 - C_2$$

Goal of MNE is to maximize TT subject to constraints $Y_1 = X_1$ and

$Y_2 = X_2$

$L_{TT} = P_1 Y_1 - C_1 + P_2 Y_2 - C_2 + \lambda(X_1 - Y_1) + \delta(X_2 - Y_2)$

$$\left. \begin{array}{l} \partial L / \partial Y_1 = P_1 + Y_1 \, dP_1/dY_1 - \lambda = 0 \\[12pt] \partial L / \partial X_1 = -dC_1/dX_1 + \lambda = 0 \end{array} \right\}^1 \qquad \lambda = MR_1 = MC_1$$

$$\left. \begin{array}{l} \partial L / \partial Y_2 = P_2 + Y_2 \, dP_2/dY_2 - \delta = 0 \\[12pt] \partial L / \partial X_2 = -dC_2/dX_2 + \delta = 0 \end{array} \right\} \qquad \delta = MR_2 = MC_2$$

$$\left. \begin{array}{l} \partial L / \partial \lambda = X_1 - Y_1 = 0 \\[12pt] \partial L / \partial \delta = X_2 - Y_2 = 0 \end{array} \right\} \qquad \text{constraints must apply}$$

First order conditions for profit maximization under no trade are:

1) $MR_1 = MC_1$

2) $MR_2 = MC_2$

III. <u>First Order Conditions for Profit Maximization When Firms Engage</u>

<u>in Trade</u>

$TT_1 = P_1 Y_1 - C_1 + Pm_2 M_2 - Pm_1 M_1$

$TT_2 = P_2 Y_2 - C_2 + Pm_1 M_1 - Pm_2 M_2$

$TT = P_1 Y_1 - C_1 + P_2 Y_2 - C_2$

where $M_2 = X_1 - Y_1 = 0$

---

1.  Explicitly assuming demand and cost independence between the firms.
    That is $dP_1/dY_2 = dP_2/dY_1 = dC_1/dX_2 = dC_2/dX_1 = 0$. See Hirschleifer,
    <u>Journal of Business</u>, July 1956, pp. 172-184.

$$M_1 = X_2 - Y_2 = 0$$

$$M_1 + M_2 = 0$$

Goal of MNE is to maximize TT subject to constraint $X_1 - Y_2 + X_2 - Y_1 = 0$

$$L_{TT} = P_1 Y_1 - C_1 + P_2 Y_2 - C_2 + \lambda(X_1 + X_2 - Y_1 - Y_2)$$

$$\partial L / \partial Y_1 = P_1 + Y_1 \, dP_1/dY_1 - \lambda = 0$$

$$\partial L / \partial X_1 = -dC_1/dX_1 + \lambda = 0$$

$$\partial L / \partial Y_2 = P_2 + Y_2 \, dP_2/dY_2 - \lambda = 0$$

$$\partial L / \partial X_2 = -dC_2/dX_2 + \lambda = 0$$

$$\partial L / \partial \lambda = X_1 + X_2 - Y_1 - Y_2 = 0 \text{ (constraint)}$$

$$\lambda = MR_1 = MC_1 = MR_2 = MC_2 \text{ first order condition under trade}$$

## Appendix II.2

### Factor Utilization Conditions Under Free Trade

I. Assumptions of Model

$$C_i = PL_i L_i + PK_i K_i \text{ where } PL_i = f(L_i) \quad (i = 1, 2)$$

$$PK_i = f(K_i)$$

$$X_i = f(L_i, K_i) \text{ where } dX_i/dL_i > 0 \quad dX_i/dK_i > 0$$

II. Profit Maximization Under No Trade

$$TT_1 = P_1 Y_1 - C_1 = P_1 Y_1 - [PL_1 L_1 + PK_1 K_1]$$

$$TT_2 = P_2 Y_2 - C_2 = P_2 Y_2 - [PL_2 L_2 + PK_2 K_2]$$

where $X_1 = Y_1$ and $X_2 = Y_2$

$$TT = P_1Y_1 + P_2Y_2 - PL_1L_1 - PK_1K_1 - PL_2L_2 - PK_2K_2$$

The goal of the corporation is to maximize TT subject to above constraints.

$$L_{TT} = P_1Y_1 + P_2Y_2 - PL_1L_1 - PK_1K_1 - PL_2L_2 - PK_2K_2 + \lambda(X_1-Y_1) +$$

$$\delta(X_2-Y_2)$$

$$\partial L/\partial Y_1 = P_1 + Y_1 \; dP_1/dY_1 - \lambda = 0$$

$$\partial L/\partial Y_2 = P_2 + Y_2 \; dP_2/dY_2 - \delta = 0$$

$$\partial L/\partial L_1 = -PL_1 - L_1 \; dPL_1/dL_1 + \lambda \; dX_1/dL_1 = 0$$

$$\partial L/\partial K_1 = -PK_1 - K_1 \; dPK_1/dK_1 = \lambda \; dX_1/dL_1 = 0$$

$$\partial L/\partial L_2 = -PL_2 - L_2 \; dPL_2/dL_2 + \delta \; dX_2/dL_2 = 0$$

$$\partial L/\partial K_2 = -PK_2 - K_2 \; dPK_2/dK_2 + \delta \; dX_2/dK_2 = 0$$

Rearranging

$$\lambda = MR_2 = \frac{PL_1 + L_1 \; dPL_1/dL_1}{dX_1/dL_1} + \frac{PK_1 + K_1 \; dPK_1/dK_1}{dX_1/dK_1}$$

$$\delta = MR_2 = \frac{PL_2 + L_2 \; dPL_2/dL_2}{dX_2/dL_2} = \frac{PK_2 + K_2 \; dPK_2/dK_2}{dX_2/dK_2}$$

That is $1/MR_1 = MPL_1/MCL_1 = MPK_1/MCK_1$

$$1/MR_2 = MPL_2/MCL_2 = MPK_2/MCK_2$$

Each firm maximizes profits by producing where costs are minimized. That is, by equating the marginal productivity per factor dollar of each factor to the inverse of marginal revenue. Note that $MR_1$ does not necessarily equal $MR_2$.

III. <u>Profit Maximization Under Intrafirm Trade</u>

$$TT_1 = P_1Y_1 - PL_1L_1 - PK_1K_1$$

$$TT_2 = P_2Y_2 - PL_2L_2 - PK_2K_2$$

where $X_1 + X_2 - Y_1 - Y_2 = 0$

$$L_{TT} = P_1Y_1 + P_2Y_2 - PL_1L_1 - PK_1K_1 - PL_2L_2 - PK_2K_2 + \lambda(X_1+X_2-Y_1-Y_2)$$

$$\partial L/\partial Y_1 = MR_1 - \lambda = 0$$

$$\partial L/\partial Y_2 = MR_2 - \lambda = 0$$

$$\partial L/\partial L_1 = -PL_1 - L_1 \ dP_1/dL_1 + \lambda \ dX_1/dL_1 = 0$$

$$\partial L/\partial K_1 = -PK_1 - K_1 \ dPK_1/dK_1 + \lambda \ dX_1/dK_1 = 0$$

$$\partial L/\partial L_2 = -PL_2 - L_2 \ dPL_2/dL_2 + \lambda \ dX_2/dL_2 = 0$$

$$\partial L/\partial K_2 = -PK_2 - K_2 \ dPK_2/dK_2 + \lambda \ dX_2/dK_2 = 0$$

Rearranging

$$\lambda = MR_1 = MCL_1/MPL_1 = MCK_1/MPK_1 = MR_2 = MCL_2/MPL_2 = MCK_2/MPK_2$$

or $1/MR_1 = 1/MR_2 = MPL_1/MCL_1 = MPL_2/MCL_2 = MPK_1/MCK_1 = MPK_2/MCK_2$

Under intrafirm trade the corporation maximizes profits by equating the marginal productivity per factor dollar of each factor to the inverse of the marginal revenue of each firm.

## IV. Perfect Competition in Factor Markets

By assumption both firms purchase their factors in perfectly competitive markets so that actions of either firm have no effect on factor prices. The profit maximization conditions therefore become:

No Trade:

1) $1/MR_1 = MPL_1/PL_1 = MPK_1/PK_1$

2) $1/MR_2 = MPK_2/PK_2 = MPL_2/PL_2$

Trade: $1/MR_1 = 1/MR_2 = MPL_1/PL_1 = MPL_2/PL_2 = MPK_1/PK_1 = MPK_2/PK_2$.

## V. Capital Market

By assumption the capital market is perfectly mobile so $PK_1 = PK_2$.

Under intrafirm trade therefore $MPK_1/PK_1 = MPK_2/PK_2$ and $MPK_1 = MPK_2$.

When there is no trade $MR_1 \neq MR_2$ and therefore $MPK_1 \neq MPK_2$,

although $PK_1 = PK_2$.

## Appendix II.3

### Criteria for Changes in Total Output and Sales

### When Trade is Introduced

## I. Assumptions

$$MR_1 = a_1 + b_1 Y_1$$

$$MR_2 = a_2 + b_2 Y_2$$

$$MC_1 = c_1 + d_1 X_1$$

$$MC_2 = c_2 + d_2 X_2$$

where $b_1$, $b_2 < 0$    $d_1$, $d_2 > 0$    $MR_1$, $MR_2$, $MC_1$, $MC_2$ are linear curves

Rearranging

$$Y_1 = (MR_1 - a_1)/b_1 \qquad Y_2 = (MR_2 - a_2)/b_2$$

$$X_1 = (MC_1 - c_1)/d_1 \qquad X_2 = (MC_2 - c_2)/d_2$$

Under no trade firm 1 produces where $MR_1 = MC_1$.

Under no trade firm 2 produces where $MR_2 = MC_2$.

When intrafirm trade is introduced the MNE:

1) brings $MR_1$ and $MR_2$ into equality without adjusting total sales. That is, $MR_1 = MR_2 = MR$.

2) brings $MC_1$ and $MC_2$ into equality without adjusting total output. That is, $MC_1 = MC_2 = MC$.

3) equates MR and MC and in so doing may cause total output and sales to rise, fall or remain unchanged. The criterion for this is:

    1) $\underline{MR > MC}$. If MR exceeds MC bringing them into equality involves lowering MR and raising MC. That is total output and sales of the corporation expand.

    2) $\underline{MR < MC}$. If MC exceeds MR the corporation must lower MC and raise MR. Therefore total output and sales contract under trade.

    3) $\underline{MR = MC}$. No further changes are necessary and therefore total output and sales are unchanged.

In terms of the intercepts and slopes of the curves the criterion for output changes may be derived as follows:

Let $MR_1 = MR_2 = MR$ total sales then become:

$$Y = Y_1 + Y_2 = (MR - a_1)/b_1 + (MR - a_2)/b_2 = MR[1/b_1 + 1/b_2] - a_1/b_1 - a_2/b_2$$

Let $MC_1 = MC_2 = MC$ total output then becomes:

$$X = X_1 + X_2 = (MC - c_1)/d_1 + (MC - c_2)/d_2 = MC[1/d_1 + 1/d_2] - c_1/d_1 - c_2/d_2$$

Rearranging in terms of MR and MC:

$$MR = \frac{a_1 b_2 + a_2 b_1 + Y(b_1 b_2)}{b_1 + b_2}$$

$$MC = \frac{c_1 d_2 + c_2 d_1 + X(d_1 d_2)}{d_1 + d_2}$$

Since $X_1 + X_2$ must equal $Y_1 + Y_2$, $X = Y$

Let $X = Y = Z$

1) Then output and sales expand if MR > MC or

$$\frac{a_1 b_2 + a_2 b_1 + Z(b_1 b_2)}{b_1 + b_2} > \frac{c_1 d_2 + c_2 d_1 + Z(d_1 d_2)}{d_1 + d_2}$$

2) Output and sales contract if MR < MC or

$$\frac{a_1 b_2 + a_2 b_1 + Z(b_1 b_2)}{b_1 + b_2} < \frac{c_1 d_2 + c_2 d_1 + Z(d_1 d_2)}{d_1 + d_2}$$

3) Output and sales are unchanged if MR = MC or

$$\frac{a_1 b_2 + a_2 b_1 + Z(b_1 b_1)}{b_1 + b_2} = \frac{c_1 d_2 + c_2 d_1 + Z(d_1 d_2)}{d_1 + d_2}$$

That is, unless we know the slopes and intercepts of all four marginal revenue and marginal cost curves it is impossible to determine how total output and sales are affected by the introduction of intrafirm trade.

## Appendix II.4

### Pure Profits of the Multinational Enterprise

I. Assumptions

$$TT_1 = P_1 Y_1 - C_1 + Pm_2 M_2 - Pm_1 M_1$$

$$TT_2 = P_2 Y_2 - C_2 + Pm_1 M_1 - Pm_2 M_2$$

II. <u>Pure Profit When Firms do not Engage in Trade</u>

$$TT_1 = P_1Y_1 - C_1$$

$$TT_2 = P_2Y_2 - C_2$$

where $X_1 = Y_1$    $X_2 = Y_2$

$$TT_1 = Y_1(P_1 - AC_1)$$

$$TT_2 = Y_2(P_2 - AC_2)$$

$$TT = Y_1(P_1 - AC_1) + Y_2(P_2 - AC_2)$$

III. <u>Pure Profit Where Firms Engage in Trade</u>

$$TT_1 = P_1Y_1 - C_1 + Pm_2M_2 - Pm_1M_1$$

$$TT_2 = P_2Y_2 - C_2 + Pm_1M_1 - Pm_2M_2$$

where $M_2 = X_1 - Y_1$

$\quad\quad M_1 = X_2 - Y_2$

$\quad\quad M_1 + M_2 = 0$

1) <u>If firm 1 is the exporter</u>    $Pm_1 = 0$

$$TT_1 = P_1Y_1 - C_1 + Pm_2M_2$$

$$TT_2 = P_2Y_2 - C_2 - Pm_2M_2$$

$$TT_1 = P_1Y_1 - C_1(Y_1 + M_2) + Pm_2M_2$$

$$\quad\quad P_1Y_1 - C_1(Y_1) - C_1(M_2) + Pm_2M_2$$

$$TT_1 = Y_1(P_1 - AC_1) + M_2(Pm_2 - AC_1)$$

$$TT_2 = P_2(X_2 + M_2) - C_2 - Pm_2M_2$$

$$\quad\quad = P_2X_2 + P_2M_2 - C_2 - Pm_2M_2$$

$$TT_2 = X_2(P_2 - AC_2) + M_2(P_2 - Pm_2)$$

$$TT = TT_1 + TT_2 = Y_1(P_1 - AC_1) + M_2(Pm_2 - AC_1) + X_2(P_2 - AC_2) +$$
$$M_2(P_2 - Pm_2)$$

$$TT = Y_1(P_1 - AC_1) + X_2(P_2 - AC_2) + M_2(P_2 - AC_1)$$

2) **If firm 2 is the exporter**   $Pm_2 = 0$

$$TT_1 = P_1Y_1 - C_1 - Pm_1M_1$$

$$TT_2 = P_2Y_2 - C_2 + Pm_1M_1$$

$$TT_1 = P_1(X_1 + M_1) - C_1 - Pm_1M_1$$

$$TT_1 = X_1(P_1 - AC_1) + M_1(P_1 - Pm_1)$$

$$TT_2 = P_2Y_2 - C_2(Y_2 + M_1) + Pm_1M_1$$

$$TT_2 = Y_2(P_2 - AC_2) + M_1(Pm_1 - AC_2)$$

$$TT = X_1(P_1 - AC_1) + Y_2(P_2 - AC_2) + M_1(P_1 - AC_2)$$

## Appendix II.5

## Profit Maximization When Price Discrimination is Impossible

I. **Assumptions of Model**

$$TT_1 = P_1Y_1 - C_1 + Pm_2M_2 - Pm_1M_1$$

$$TT_2 = P_2Y_2 - C_2 - Pm_2M_2 + Pm_1M_1$$

The goal of the corporation is to maximize $TT_1 + TT_2$ subject to the constraints that 1) $X_1 + X_2 = Y_1 + Y_2$

2) $P_1 = P_2 = P$

$$TT = P_1Y_1 - C_1 + P_2Y_2 - C_2$$

$$TT = P(Y_1 + Y_2) - C_1 - C_2$$

$$L_{TT} = P(Y_1 + Y_2) - C_1 - C_2 + \lambda(X_1 + X_2 - Y_1 - Y_2)$$

$$\partial L/\partial Y_1 = P + (Y_1 + Y_2)\ dP/dY_1 - \lambda = 0$$

$$\partial L/\partial X_1 = -dC_1/dX_1 + \lambda = 0$$

$$\partial L/\partial Y_2 = P + (Y_1 + Y_2)\ dP/dY_2 - \lambda = 0$$

$$\partial L/\partial X_2 = -dC_2/dX_2 + \lambda = 0$$

The condition for profit maximization is therefore:

$$P + (Y_1 + Y_2)\ dP/dY_1 = MC_1 = P + (Y_1 + Y_2)\ dP/dY_2 = MC_2$$

But $P + (Y_1 + Y_2)\ dP/dY_1 = P + (Y_1 + Y_2)\ dP/dY_2 = MR$. That is,

the corporation should equate the marginal production cost in each

plant to the marginal revenue of the combined sales. This is

illustrated in Figure I.

In Figure I the marginal cost curves of firms 1 and 2 are

summed horizontally and shown in the right diagram as the $\Sigma MC$ curve.

This curve indicates for each level of $MC_1 = MC_2$ the total volume

of output the two plants would be willing to supply. The two

average revenue curves are summed horizontally and a marginal

revenue curve with respect to the total sales is constructed

from the summed average revenue curve. Where the $\Sigma MC$ and $\Sigma MR$

curves intersect fulfills the condition: $MC_1 = MC_2 = MR(Y_1 + Y_2)$.

Note that it also fulfills the condition: $MC_1 = MC_2 = MR_1 = MR_2$.

The consumer prices charged in each market must be equal

if price discrimination is prohibitive. Running vertically

upward from the intersection of the $\Sigma MR$ and $\Sigma MC$ curves to the

$\Sigma AR$ curve determines the equilibrium price, $P^\circ$. Tracking back

from $P^\circ$ to the average revenue curves in each market determines

the allocation of sales. Firm 1 sells $Y_1^\circ$ at $P_1^\circ$ and firm 2 sells

Figure I

Profit Maximization by a Multi-Plant Discriminating Monopolist
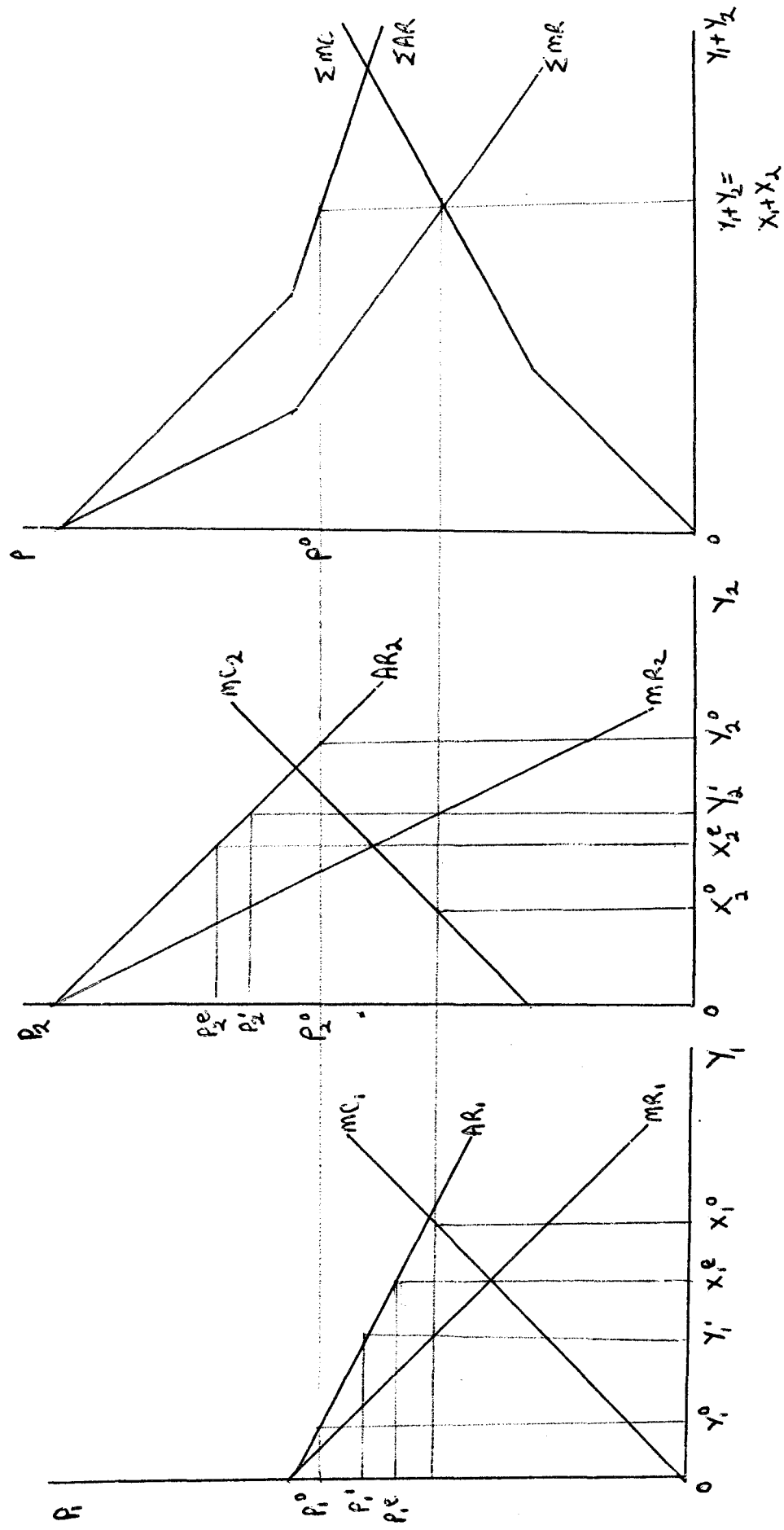
$Y_2^\circ$ at $P_2^\circ$ (where $P_1^\circ = P_2^\circ = P^\circ$). Tracking back from the inter-
section of $\Sigma MC$ with $\Sigma MR$ to the individual marginal cost curves

determines the allocation of output between the two plants. Firm

1 produces $X_1^\circ$ at a marginal cost of $MC_1^\circ$ and firm 2 produces

$X_2^\circ$ at a marginal cost of $MC_2^\circ$.

If the corporation can discriminate between markets it will

equate $MR_1 = MR_2 = MC_1 = MC_2$. This will not change the total

volume of output and sales, nor the allocation of output between

the two plants. However, the allocation of sales will be different.

The distribution of sales will be determined by tracking back

from the intersection of $\Sigma MR$ with $\Sigma MC$ to the respective marginal

revenue curves. Firm 1 will sell $Y_1^1$ domestically and firm 2

will sell $Y_2^1$.

Where consumer prices must be equal the volume of trade

equals $X_1^\circ - Y_1^\circ$ or $Y_2^\circ - X_2^\circ$, with trade flowing from firm 1

to firm 2. Trade flows from the low cost-low revenue firm to the

high cost-high revenue firm. Where price discrimination is pos-

sible the volume of trade is smaller ($X_1^\circ - Y_1^1 = Y_2^1 - X_2^\circ$) but

the direction of trade flow is unchanged. Price discrimination

results in lowered consumer prices in firm 1 (to $P_1^1$) and higher

prices in firm 2 (to $P_2^1$). In either situation the transfer price

plays no role in the profit maximizing decision.

Note that in the pretrade situation firm 1 produced and sold

$X_1^e$ at $P_1^e$. Firm 2 produced and sold $X_2^e$ at $P_2^e$. The introduction

of trade with price discrimination causes prices in country 1 to

rise to $P_1^1$ and country 2 to fall to $P_2^1$. The introduction of trade

without discrimination causes price shifts to $P_1^\circ$ and $P_2^\circ$. The

changes in prices from the no trade situation are smaller if price

discrimination is possible.

Appendix III.1

Profit Maximization Under Tariff Barriers

I. Assumptions of Model

$$TT_1 = P_1 Y_1 - C_1 + Pm_2 M_2 - Pm_1 M_1$$

$$TT_2 = P_2 Y_2 - C_2 + Pm_1 M_1 - (1 + r)Pm_2 M_2$$

where r is tariff rate charged on country 2's imports

$$M_2 = X_1 - Y_1$$

$$M_1 = X_2 - Y_2$$

$$M_1 + M_2 = 0$$

II. First Order Conditions for Profit Maximization Under a Tariff

$$TT = P_1 Y_1 - C_1 + P_2 Y_2 - C_2 - rPm_2 M_2$$

$$L_{TT} = P_1 Y_1 - C_1 + P_2 Y_2 - C_2 - rPm_2 M_2 + \lambda(X_1 + X_2 - Y_1 - Y_2)$$

$$\partial L/\partial Y_1 = MR_1 + rPm_2 - rM_2 \ dPm_2/dY_1 - \lambda = 0$$

$$\partial L/\partial X_1 = -MC_1 - rPm_2 - rM_2 \ dPm_2/dX_1 + \lambda = 0$$

$$\partial L/\partial Y_2 = MR_2 - rM_2 \ dPm_2/dY_2 - \lambda = 0$$

$$\partial L/\partial X_2 = -MC_2 - rM_2 \ dPm_2/dX_2 + \lambda = 0$$

First Order Conditions are:

$$MR_1 + rPm_2 - rM_2 \ dPm_2/dY_1 = MC_1 + rPm_2 + rM_2 \ dPm_2/dX_1 = MR_2 -$$
$$rM_2 \ dPm_2/dY_2 = MC_2 + rM_2 \ dPm_2/dX_2$$

which reduces to $MR_1 + rPm_2 = MC_1 + rPm_2 = MR_2 = MC_2$ when the

transfer price is fixed.

## Appendix III.2

### Factor Utilization Conditions Under a Tariff Barrier

$$TT = P_1 Y_1 - C_1 + P_2 Y_2 - C_2 - rPm_2 M_2$$

$$TT = P_1 Y_1 - [PL_1 L_1 + PK_1 K_1] + P_2 Y_2 - [PL_2 L_2 + PK_2 K_2] - rPm_2 M_2$$

$$L_{TT} = P_1 Y_1 - PL_1 L_1 - PK_1 K_1 + P_2 Y_2 - PL_2 L_2 - PK_2 K_2 - rPm_2 M_2 + \lambda (X_1 + X_2 - Y_1 - Y_2)$$

$$\partial L / \partial Y_1 = MR_1 + rPm_2 - rM_2 \ dPm_2 / dY_1 - \lambda = 0$$

$$\partial L / \partial Y_2 = MR_2 - rM_2 \ dPm_2 / dY_2 - \lambda = 0$$

$$\partial L / \partial L_1 = -PL_1 - L_1 \ dPL_1 / dL_1 - rPm_2 \ dM_2 / dL_1 - rM_2 \ dPm_2 / dL_1 + \lambda \ dX_1 / dL_1 = 0$$

$$\partial L / \partial K_1 = -PK_1 - K_1 \ dPK_1 / dK_1 - rPm_2 \ dM_2 / dK_1 - rM_2 \ dPm_2 / dK_1 + \lambda \ dX_1 / dK_1 = 0$$

$$\partial L / \partial L_2 = -PL_2 - L_2 \ dPL_2 / dL_2 - rM_2 \ dPm_2 / dL_2 + \lambda \ dX_2 / dL_2 = 0$$

$$\partial L / \partial K_2 = -Pk_2 - K_2 \ dPK_2 / dK_2 - rM_2 \ dPm_2 / dK_2 + \lambda \ dX_2 / dK_2 = 0$$

Rearranging in terms of firm 1

$$MR_1 + rPm_2 - rM_2 \ dPm_2 / dY_1 = \frac{MCL_1 + rPm_2 \ dX_1 / dL_1 + rM_2 \ dPm_2 / dL_1}{dX_1 / dL_1} =$$

$$\frac{MCK_1 + rPm_2 \ dX_1 / dK_1 + rM_2 \ dPm_2 / dL_1}{dX_1 / dK_1} = \lambda$$

Rearranging for firm 2

$$\lambda = MR_2 - rM_2 \ dPm_2 / dY_2 = \frac{MCL_2 + rM_2 \ dPm_2 / dL_2}{dX_2 / dL_2} = \frac{MCK_2 + rM_2 \ dPm_2 / dK_2}{dX_2 / dK_2}$$

The corporation in maximizing profits must now include the tariff on imports in the factor utilization conditions.

The factor utilization condition under a fixed transfer price reduce to:

$$MR_1 + rPm_2 = MCL_1 / MPL_1 + rPm_2 = MCK_1 / MPK_1 + rPm_2 = MR_2 = MCL_2 / MPL_2 =$$

$$MCK_2 / MPK_2$$

Appendix III.3

Pure Profits Under a Tariff Barrier

I.  Conditions if Firm 1 is the Exporter i.e. $Pm_1 = 0$

$$TT_1 = P_1 Y_1 - C_1(X_1) + Pm_2 M_2$$

$$= P_1 Y_1 - C_1(Y_1) - C_1(M_2) + Pm_2 M_2$$

$$TT_1 = Y_1(P_1 - AC_1) + M_2(Pm_2 - AC_1)$$

$$TT_2 = P_2 Y_2 - C_2(X_2) - (1 + r)Pm_2 M_2$$

$$= P_2 X_2 + P_2 M_2 - C_2(X_2) - (1 + r)Pm_2 M_2$$

$$TT_2 = X_2(P_2 - AC_2) + M_2(P_2 - (1 + r)Pm_2)$$

$$TT = P_1 Y_1 - C_1 + P_2 Y_2 - C_2 - rPm_2 M_2$$

$$TT = Y_1(P_1 - AC_1) + X_2(P_2 - AC_2) + M_2(P_2 - rPm_2 - AC_1)$$

II. Conditions if Firm 2 is the Exporter $(Pm_2 = 0)$

$$TT_1 = P_1 Y_1 - C_1 - Pm_1 M_1$$

$$TT_2 = P_2 Y_2 - C_2 + Pm_1 M_1$$

$$TT = P_1 Y_1 - C_1 + P_2 Y_2 - C_2$$

$$TT_1 = P_1(X_1 + M_1) - C_1(X_1) - Pm_1 M_1$$

$$TT_1 = X_1(P_1 - AC_1) + M_1(P_1 - Pm_1)$$

$$TT_2 = P_2 Y_2 - C_2(Y_2 + M_1) + Pm_1 M_1$$

$$TT_2 = Y_2(P_2 - AC_2) + M_1(Pm_1 - AC_2)$$

$$TT = X_1(P_1 - AC_1) + Y_2(P_2 - AC_2) + M_1(P_1 - AC_2)$$

Appendix III.4

Proof That $\Delta AC = \Delta AR$ Under Linear Assumptions

$$MC_1 = a + bX_1$$

$$AC_1 = a + 1/2bX_1$$

$$MR_1 = c + dY_1$$

$$AR_1 = c + 1/2dY_1$$

Solving for $AC_1$ in terms of $MC_1$: $\quad X_1 = \dfrac{2(AC_1 - a)}{b}$

$$X_1 = \dfrac{(MC_1 - a)}{b}$$

$$\therefore 2AC_1 - a = MC_1$$

and $2\Delta AC_1 = \Delta MC_1$

Solving for $AR_1$ in terms of $MR_1$: $\quad Y_1 = \dfrac{2(AR_1 - C)}{d}$

$$Y_1 = \dfrac{MR_1 - C}{d}$$

$$\therefore 2AR_1 - C = MR_1$$

and $2\Delta AR_1 = \Delta MR_1$

If $\Delta MR_1 = \Delta MC_1$ then

$$2\Delta AR_1 = 2\Delta AC_1$$

and $\Delta AR_1 = \Delta AC_1$

Q.E.D.

Appendix IV.1

Profit-Maximization Conditions Under a Pure Profits Tax

I. Assumptions

$$TT_1 = (1 - t)(P_1Y_1 - C_1 + Pm_2M_2 - Pm_1M_1)$$

$$TT_2 = (1 - bt)(P_2Y_2 - C_2 - Pm_2M_2 - Pm_1M_1)$$

where $t$ is tax rate on pure profits levied by country 1 on

all resident profits (profits at home + repatriated profits)

$b$ is rate of repatriation of firm 2's profits $0 \leq b \leq 1$

where $b = 0$ equivalent to source rule, no taxation of $TT_2$

   $b = 1$ equivalent to resident rule where firm 2 is a

      branch and all profits are taxed as earned

   $0 < b < 1$ equivalent to residence rule where firm 2 is

      a subsidiary incorporated in country 2 and $bTT_2$

      is taxed.

$$M_2 = X_1 - Y_1$$

$$M_1 = X_2 - Y_2$$

$$M_1 + M_2 = 0$$

II. First Order Conditions for Profit Maximization Under a Tax

$$TT = (1 - t)[P_1Y_1 - C_1 + Pm_2M_2 - Pm_1M_1] + (1 - bt)[P_2Y_2 - C_2 + Pm_1M_1 - Pm_2M_2]$$

$$L_{TT} = (1 - t)[P_1Y_1 - C_1] + (1-bt)[P_2Y_2 - C_2] + (t - bt)Pm_1M_1 - (t - bt)Pm_2M_2$$

$$\partial L/\partial Y_1 = (1 - t)MR_1 + (t - bt)M_1\ dPm_1/dY_1 + (t - bt)Pm_2 -$$
$$(t - bt)M_2\ dPm_2/dY_1 - \lambda = 0$$

$$\partial L/\partial X_1 = -(1 - t)MC_1 + (t - bt)M_1\ dPm_1/dX_1 - (t - bt)Pm_2 -$$
$$(t - bt)M_2\ dPm_2/dX_1 + \lambda = 0$$

$$\partial L/\partial Y_2 = (1 - bt)MR_2 - (t-bt)Pm_1 + (t-bt)M_1\ dPm_1/dY_2 - (t-bt)M_2$$
$$dPm_2/dY_2 - \lambda = 0$$

$$\partial L/\partial X_2 = -(1-bt)MC_2 + (t-bt)Pm_1 + (t-bt)M_1\ dPm_1/dX_2 - (t-bt)M_2$$
$$dPm_2/dX_2 + \lambda = 0$$

Equilibrium General Condition is: $\lambda =$

$$(1-t)MR_1 + (t-bt)M_1\ dPm_1/dY_1 + (t-bt)Pm_2 - (t-bt)M_2\ dPm_2/dY_2 =$$

$$(1-t)MC_1 - (t-bt)M_1\ dPm_1/dX_1 + (t-bt)Pm_2 + (t-bt)M_2\ dPm_2/dX_1 =$$

$$(1-bt)MR_2 - (t-bt)Pm_1 + (t-bt)M_1\ dPm_1/dY_2 - (t-bt)M_2\ dPm_2/dY_2 =$$

$$(1-bt)MC_2 - (t-bt)Pm_1 - (t-bt)M_1\ dPm_1/dX_2 + (t-bt)M_2\ dPm_2/dX_2$$

If firm 1 is the exporter this reduces to: $(Pm_1 = 0)$

$$(1-t)MR_1 + (t-bt)Pm_2 - (t-bt)M_2\ dPm_2/dY_1 = (1-t)MC_1 + (t-bt)Pm_2 +$$
$$(t-bt)M_2\ dPm_2/dX_1 = (1-bt)MR_2 - (t-bt)M_2\ dPm_2/dY_2 = (1-bt)MC_2 +$$
$$(t-bt)M_2\ dPm_2/dX_2$$

If firm 2 is the exporter this reduces to: $(Pm_2 = 0)$

$$(1-t)MR_1 + (t-bt)M_1\ dPm_1/dY_1 = (1-t)MC_1 + (t-bt)M_1\ dPm_1/dX_1 =$$
$$(1-bt)MR_2 - (t-bt)Pm_1 + (t-bt)M_1\ dPm_1/dY_2 = (1-bt)MC_2 - (t-bt)Pm_1$$
$$- (t-bt)M_1\ dPm_1/dX_2$$

Where $Pm_1 = Pm_2$ these two conditions are identical. Therefore we can concentrate on the 'firm 1 as exporter' case, knowing the profit maximizing condition does not change where firm 2 is the exports. The tax effects are different but the equilibrium condition is unchanged.

Rearranging the equilibrium condition where firm 1 is the exporter:

$$\frac{1-t}{1-bt}MR_1 + \frac{t-bt}{1-bt}Pm_2 - \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dY_1} + \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dY_2} = MR_2 = MC_2 =$$

$$\frac{1-t}{1-bt}MC_1 + \frac{t-bt}{1-bt}Pm_2 + \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dX_1} - \frac{t-bt}{1-bt}M_2\frac{dPm_2}{dX_2}$$

The first order condition under a fixed transfer price is thus:

$$\frac{1-t}{1-bt}MR_1 + \frac{t-bt}{1-bt}Pm_2 = \frac{1-t}{1-bt}MC_1 + \frac{t-bt}{1-bt}Pm_2 = MR_2 = MC_2$$

Appendix IV.2

Factor Utilization Conditions Under a Pure Profits Tax

I. Assumptions

$$TT_1 = (1-t)[P_1Y_1 - C_1 + Pm_2M_2 - Pm_1M_1]$$

$$TT_2 = (1-bt)[P_2Y_2 - C_2 - Pm_2M_2 + Pm_1M_1]$$

where $C_1 = PL_1L_1 + PK_1K_1$

$$C_2 = PL_2L_2 + PK_2K_2$$

II. Factor Utilization Conditions

$$L_{TT} = (1-t)P_1Y_1 - (1-t)[PL_1L_1 + PK_1K_1] + (1-bt)P_2Y_2 - (1-bt)[PL_2L_2 +$$

$$PK_2K_2] - (t-bt)Pm_2M_2 + (t-bt)Pm_1M_1 + \lambda(X_1 + X_2 - Y_1 - Y_2)$$

$$\partial L/\partial Y_1 = (1-t)MR_1 + (t-bt)Pm_2 - (t-bt)M_2 \ dPm_2/dY_1 + (t-bt)M_1 \cdot$$

$$dPm_1/dY_1 - \lambda = 0$$

$$\partial L/\partial Y_2 = (1-bt)MR_2 - (t-bt)Pm_1 + (t-bt)M_1 \ dPm_1/dY_2 - (t-bt)M_2 \cdot$$

$$dPm_2/dY_2 - \lambda = 0$$

$$\partial L/\partial L_1 = -(1-t)PL_1 - (1-t)L_1 \ dPL_1/dL_1 - (t-bt)Pm_2 \ dX_1/dL_1 - (t-bt)M_2 \cdot$$

$$dPm_2/dL_1 + (t-bt)M_1 \ dPm_1/dL_1 + \lambda \ dX_1/dL_1 = 0$$

$$\partial L/\partial K_1 = -(1-t)PK_1 - (1-t)K_1 \ dPK_1/dK_1 - (t-bt)Pm_2 \ dX_1/dK_1 -$$

$$(t-bt)M_2 \ dPm_2/dK_1 + (t-bt)M_1 \ dPm_1/dK_1 + \lambda \ dX_1/dL_1 = 0$$

$$\partial L/\partial L_2 = -(1-bt)PL_2 - (1-bt)L_2 \ dPL_2/dL_2 - (t-bt)M_2 \ dPm_2/dL_2 +$$

$$(t-bt)Pm_1 \ dX_2/dL_2 + (t-bt)M_1 \ dPm_1/dL_2 + \lambda \ dX_2/dL_2 = 0$$

$$\partial L/\partial K_2 = -(1-bt)PK_2 - (1-bt)K_2 \ dPK_2/dK_2 - (t-bt)M_2 \ dPm_2/dK_2 +$$

$$(t-bt)Pm_1 \ dX_2/dK_2 + (t-bt)M_1 \ dPm_1/dK_2 + \lambda \ dX_2/dK_2 = 0$$

where firm 1 is the exporter ($Pm_1 = 0$) these conditions reduce to:

$$(1-t)MR_1 + (t-bt)Pm_2 - (t-bt)M_2 \ dPm_2/dY_1 = (1-bt)MR_2 - (t-bt)M_2 \cdot$$

$$dPm_2/dY_2 = (1-t)MCL_1/MPL_1 + (t-bt)Pm_2 + (t-bt)M_2 \ dPm_2/dX_1 =$$

$$(1-t)MCK_1/MPK_1 + (t-bt)Pm_2 + (t-bt)M_2 \ dPm_2/dX_1 =$$

$$(1-bt)MCL_2/MPL_2 + (t-bt)M_2 \ dPm_2/dX_2 =$$

$$(1-bt)MCK_2/MPK_2 + (t-bt)M_2 \ dPm_2/dX_2$$

where firm 2 is the exporter ($Pm_2 = 0$) the conditions reduce to:

$$(1-t)MR_1 + (t-bt)M_1 \ dPm_1/dY_1 = (1-bt)MR_2 - (t-bt)Pm_1 + (t-bt)M_1 \cdot$$

$$dPm_1/dY_2 = (1-t)MCL_1/MPL_1 - (t-bt)M_1 \ dPm_1/dX_1 = (1-t)MCK_1/MPK_1 +$$

$$(t-bt)M_1 \ dPm_1/dX_1 = (1-bt)MCL_2/MPL_2 - (t-bt)Pm_1 - (t-bt)M_1 \cdot$$

$$dPm_1/dX_2 = (1-bt)MCL_2/MPL_2 - (t-bt)Pm_1 - (t-bt)M_1\ dPm_1/dX_2$$

Since $M_1 = -M_2$ if we assume $Pm_1 = Pm_2$ these conditions are identical. The identity of the exporter does not affect the analysis. Since the factor utilization conditions do not depend on which firm is the exporter, only one set of conditions needs to be examined.

Assuming a fixed transfer price, $Pm_2$, the factor utilization conditions reduce to:

$$\frac{1-t}{1-bt}MR_1 + \frac{t-bt}{1-bt}Pm_2 = \frac{1-t}{1-bt}\frac{MCL_1}{MPL_1} + \frac{t-bt}{1-bt}Pm_2 = \frac{1-t}{1-bt}\frac{MCK_1}{MPK_1} + \frac{t-bt}{1-bt}Pm_2 =$$

$$MR_2 = \frac{MCL_2}{MPL_2} = \frac{MCK_2}{MPK_2}$$

### Appendix IV.3

### The Division of After Tax Profits

I. **Where Firm 1 is the Exporter**

$$TT_1 = (1-t)[P_1Y_1 - C_1 + Pm_2M_2]\text{ where }X_1 = Y_1 + M_2$$

$$TT_1 = (1-t)[P_1Y_1 - C_1(X_1 + M_2) + Pm_2M_2]$$

$$TT_1 = (1-t)[Y_1(P_1 - AC_1) + M_2(Pm_2 - AC_1)]$$

$$TT_2 = (1-bt)[P_2Y_2 - C_2 - Pm_2M_2]\text{ where }Y_2 = X_2 + M_2$$

$$TT_2 = (1-bt)[P_2(X_2 + M_2) - C_2(X_2) - Pm_2M_2]$$

$$TT_2 = (1-bt)[X_2(P_2 - AC_2) + M_2(P_2-Pm_2)]$$

$$TT = TT_1 + TT_2 + (1-t)[Y_1(P_1 - AC_1)] + (1-bt)[X_2(P_2 - AC_2)] +$$
$$M_2[(1-bt)P_2 - (1-t)AC_1 - (t-bt)Pm_2]$$

II.  Where Firm 2 is the Exporter

$TT_1 = (1-t)[P_1 Y_1 - C_1 - Pm_1 M_1]$ where $Y_1 = X_1 + M_1$

$TT_1 = (1-t)[P_1(X_1 + M_1) - C_1(X_1) - Pm_1 M_1]$

$TT_1 = (1-t)[X_1(P_1 - AC_1) + M_1(P_1 - Pm_1)]$

$TT_2 = (1-bt)[P_2 Y_2 - C_2 + Pm_1 M_1]$ where $X_2 = Y_2 + M_1$

$TT_2 = (1-bt)[P_2 Y_2 - C_2(Y_2 + M_1) + Pm_1 M_1]$

$TT_2 = (1-bt)[Y_2(P_2 - AC_2) + M_1(Pm_1 - AC_2)]$

$TT = TT_1 + TT_2 = (1-t)[X_1(P_1 - AC_1)] + (1-bt)[Y_2(P_2 - AC_2)] =$

$\qquad M_1[(1-t)P_1 - (1-bt)AC_2 + (t-bt)Pm_1]$


## Appendix V.1

### Profit Maximization Under Double Taxation


$TT_1 = (1-t_1)[P_1 Y_1 - C_1 - Pm_1 M_1 + Pm_2 M_2]$

$TT_2 = (1-t_2-bt_1+c)[P_2 Y_2 - C_2 + Pm_1 M_1 - Pm_2 M_2]$

where $t_1$ is the tax rate levied on firm 1's pure profits

$\qquad t_2 + bt_1 - c$ is the total tax rate levied on firm 2's pure profits

$\qquad$ b is the fraction of firm 2's profits taxable in country 1; $0 \leq b \leq 1$

$\qquad$ c is the form of tax relief provided by country 1 in determining

$\qquad\qquad$ firm 2's tax bill

where c = 0 no tax relief is given

$\qquad$ $c = bt_1 t_2$ foreign taxes are deductible in determining firm 2's

$\qquad\qquad$ tax payment to country 1

$c = bt_2$ foreign taxes are creditable against the taxes owed to

country 1 by firm 2.

$c = bt_1 t_2 + bt_2(1-t_2)$ LDC credit rules apply.

The corporation's goal is to maximize $TT_1 + TT_2$ subject to the constraint

$$X_1 + X_2 = Y_1 + Y_2$$

$$L_{TT} = (1-t_1)[P_1 Y_1 - C_1] + (1-t_2-bt_1+c)[P_2 Y_2 - C_2] - (t_1-t_2-bt_1+c)Pm_2 M_2$$

$$+ (t_1-t_2-bt_1+c)Pm_1 M_1 + \lambda(X_1 + X_2 - Y_1 - Y_2)$$

$$\partial L/\partial Y_1 = (1-t_1)MR_1 + (t_1-t_2-bt_1+c)Pm_2 - (t_1-t_2-bt_1+c)M_2\ dPm_2/dY_1$$

$$+ (t_1-t_2-bt_1+c)M_1\ dPm_1/dY_1 - \lambda = 0$$

$$\partial L/\partial X_1 = -(1-t_1)MC_1 - (t_1-t_2-bt_1+c)Pm_2 - (t_1-t_2-bt_1+c)M_2\ dPm_2/dX_1$$

$$+ (t_1-t_2-bt_1+c)M_1\ dPm_1/dX_1 + \lambda = 0$$

$$\partial L/\partial Y_2 = (1-t_2-bt_1+c)MR_2 - (t_1-t_2-bt_1+c)M_2\ dPm_2/dY_2 - (t_1-t_2-bt_1+c)Pm_1 +$$

$$(t_1-t_2-bt_1+c)M_1\ dPm_1/dY_2 - \lambda = 0$$

$$\partial L/\partial X_2 = -(1-t_2-bt_1+c)MC_2 - (t_1-t_2-bt_1+c)M_2\ dPm_2/dX_2 + (t_1-t_2-bt_1+c)Pm_1 +$$

$$(t_1-t_2-bt_1+c)M_1\ dPm_1/dX_2 + \lambda = 0$$

Where firm 1 is initially the exporter $(Pm_1 = 0)$ the equilibrium condition becomes:

$$(1-t_1)MR_1 + (t_1-t_2-bt_1+c)Pm_2 - (t_1-t_2-bt_1+c)M_2\ dPm_2/dY_1 = (1-t_1)MC_1 +$$

$$(t_1-t_1-bt_1+c)Pm_2 + (t_1-t_2-bt_1+c)M_2\ dPm_2/dX_1 = (1-t_2-bt_1+c)MR_2 -$$

$$(t_1-t_2-bt_1+c)M_2\ dPm_2/dY_2 = (1-t_2-bt_1+c)MC_2 + (t_1-t_2-bt_1+c)M_2\ dPm_2/dX_2$$

Where firm 2 is initially the exporter $(Pm_2 = 0)$ the equilibrium condition reduces to:

$$(1-t_1)MR_1 + (t_1-t_2-bt_1+c)M_1\ dPm_1/dY_1 = (1-t_1)MC_1 - (t_1-t_2-bt_1+c)M_1\ dPm_1/dX_1 =$$

$$(1-t_2-bt_1+c)MR_2 - (t_1-t_2-bt_1+c)Pm_1 + (t_1-t_2-bt_1+c)M_1 \; dPm_1/dY_2 =$$

$$(1-t_2-bt_1+c)MC_2 - (t_1-t_2-bt_1+c)Pm_1 - (t_1-t_2-bt_1+c)M_1 \; dPm_1/dX_2$$

Where $Pm_1 = Pm_2$ (since $M_1 = -M_2$) these two expressions are identical. We therefore can concentrate on one case--firm 1 as the exporter--knowing the equilibrium condition remains unchanged if firm 2 becomes the exporter.

The equilibrium condition can be rewritten as:

$$\left(\frac{1-t_1}{1-t_2-bt_1+c}\right)MR_1 + \left(\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}\right)Pm_2 - \left(\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}\right)M_2\frac{dPm_2}{dY_1} + \left(\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}\right)$$

$$M_2\frac{dPm_2}{dY_2} = \left(\frac{1-t_1}{1-t_2-bt_1+c}\right)MC_1 + \left(\frac{t_1-t_2-bt_1-c}{1-t_2-bt_1+c}\right)PM_2 + \left(\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}\right)M_2 \cdot$$

$$\frac{dPm_2}{dX_1} - \left(\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}\right)M_2\frac{dPm_2}{dX_2} = MR_2 = MC_2$$

Appendix V.2

Profit Maximization Under Specific Transfer Prices

I.  A Fixed Transfer Price

$$\frac{1-t_1}{1-t_2-bt_1+c}MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}Pm_2 = \frac{1-t_1}{1-t_2-bt_1+c}MC_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}Pm_2 =$$

$$MR_2 = MC_2$$

II.  $Pm_2 = AR_1$

$$\frac{1-t_1}{1-t_2-bt_1+c}MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}AR_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}M_2\frac{dAR_1}{dY_1} = \frac{1-t_1}{1-t_2-bt_1+c}MC_1$$

$$+ \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}AR_1 = MR_2 = MC_2$$

Since $\dfrac{1-t_1}{1-t_2-bt_1+c} = 1 - \dfrac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}$ this condition can be rewritten as:

$$MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_1 - MR_1] - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}M_2\frac{dAR_1}{dY_1} = MR_2 = MC_2 =$$

$$MC_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[AR_1 - MC_1]$$

III. $\underline{Pm_2 = AC_1}$

$$\frac{1-t_1}{1-t_2-bt_1+c}MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}AC_1 = \frac{1-t_1}{1-t_2-bt_1+c}MC_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}AC_1 +$$

$$\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}M_2\frac{dAC_1}{dX_1} = MR_2 = MC_2$$

which can be rewritten as:

$$MR_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MR_1 - AC_1] = MC_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MC_1 - AC_1] +$$

$$\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}M_2\frac{dAC_1}{dX_1} = MR_2 = MC_2$$

IV. $\underline{Pm_2 = MC_1}$

$$\frac{1-t_1}{1-t_2-bt_1+c}MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}MC_1 = \frac{1-t_1}{1-t_2-bt_1+c}MC_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}MC_1 +$$

$$\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}M_2\frac{dMC_1}{dX_1} = MR_2 = MC_2$$

which can be rewritten as:

$$MR_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MR_1 - MC_1] = MC_1 - \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}[MC_1 - MC_1] +$$

$$\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}M_2\frac{dMC_1}{dX_1} = MR_2 = MC_2$$

---

**V.**  $\underline{Pm_2 = AR_2}$

$$\frac{1-t_1}{1-t_2-bt_1+c}(MR_1) + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}(AR_2) + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}M_2\frac{dAR_2}{dY_2} =$$

$$\frac{1-t_1}{1-t_2-bt_1+c}MC_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}(AR_2) = MR_2 = MC_2$$

which can be rewritten as:

$$\frac{1-t_2-bt_1+c}{1-t_1}MR_2 - \frac{t_1-t_2-bt_1+c}{1-t_1}AR_2 - \frac{t_1-t_2-bt_1+c}{1-t_1}M_2\frac{dAR_2}{dY_2} =$$

$$\frac{1-t_2-bt_1+c}{1-t_1}MC_1 - \frac{t_1-t_2-bt_1+c}{1-t_1}AR_2 = MR_1 = MC_1$$

and since $\dfrac{1-t_2-bt_1+c}{1-t_1} = 1 + \dfrac{t_1-t_2-bt_1+c}{1-t_1}$ we can rewrite the condition

as:

$$MR_2 - \frac{t_1-t_2-bt_1+c}{1-t_1}[AR_2 - MR_2] - \frac{t_1-t_2-bt_1+c}{1-t_1}M_2\frac{dAR_2}{dY_2} = MC_2 -$$

$$\frac{t_1-t_2-bt_1+c}{1-t_1}[AR_2 - MC_2] = MR_1 = MC_1$$

**VI.**  $\underline{Pm_2 = AC_2}$

$$\frac{1-t_1}{1-t_2-bt_1+c}MR_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}AC_2 = \frac{1-t_1}{1-t_2-bt_1+c}MC_1 + \frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}AC_2 -$$

$$\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c}M_2\frac{dAC_2}{dX_2} = MR_2 = MC_2$$

which can be rewritten as:

$$MR_2 + \frac{t_1-t_2-bt_1+c}{1-t_1}[MR_2 - AC_2] = MC_2 + \frac{t_1-t_2-bt_1+c}{1-t_1}[MC_2 - AC_2] +$$

$$\frac{t_1-t_2-bt_1+c}{1-t_1}M_2\frac{dAC_2}{dX_2} = MR_1 = MC_1$$

## Appendix VI.1

### Profit Maximization Under Taxes and a Tariff

$TT_1 = (1-t_1)[P_1Y_1 - C_1 + Pm_2M_2 - Pm_1M_1]$

$TT_2 = (1-t_2-bt_1+c)[P_2Y_2 - C_2 + Pm_1M_1 - (1+r)Pm_2M_2]$

where $t_1$ is the tax rate on firm 1's pure profits

$t_2 + bt_1 - c$ is the tax rate on firm 2's pure profits

$r$ is tariff rate on firm 2's imports

$L_{TT} = (1-t_1)[P_1Y_1 - C_1] + (1-t_2-bt_1+c)[P_2Y_2 - C_2] + (t_1-t_2-bt_1+c)Pm_1M_1 -$

$[(t_1-t_2-bt_1+c) + r(1-t_2-bt_1+c)]Pm_2M_2$

Let $\alpha$ equal $1-t_2-bt_1+c$.

Let $\beta$ equal $t_1-t_2-bt_1+c$.

$L_{TT} = (1-t_1)[P_1Y_1 - C_1] + \alpha[P_2Y_2 - C_2] + \beta Pm_1M_1 - (\beta + r\alpha)Pm_2M_2 +$

$\lambda(X_1 + X_2 - Y_1 - Y_2)$

$\partial L/\partial Y_1 = (1-t_1)MR_1 + \beta M_1 \, dPm_1/dY_1 + (\beta + r\alpha)Pm_2 - (\beta + r\alpha)M_2 \, dPm_2/dY_2 - \lambda = 0$

$\partial L/\partial X_1 = -(1-t_1)MC_1 + \beta M_1 \, dPm_1/dX_1 - (\beta+r\alpha)Pm_2 - (\beta+r\alpha)M_2 \, dPm_2/dX_1 + \lambda = 0$

$\partial L/\partial Y_2 = \alpha MR_2 - \beta Pm_1 + \beta M_1 \, dPm_1/dY_2 - (\beta+r\alpha)M_2 \, dPm_2/dY_2 - \lambda = 0$

$\partial L/\partial X_2 = -\alpha MC_2 + \beta Pm_1 + \beta M_1 \, dPm_1/dX_2 - (\beta+r\alpha)M_2 \, dPm_2/dX_2 + \lambda = 0$

Where firm 1 is the initial exporter the profit maximizing condition is:

$(1-t_1)MR_1 + (\beta+r\alpha)Pm_2 - (\beta+r\alpha)M_2 \, dPm_2/dY_1 = (1-t_1)MC_1 + (\beta+r\alpha)Pm_2 +$

$(\beta+r\alpha)M_2 \, dPm_2/dX_1 = \alpha MR_2 - (\beta+r\alpha)M_2 \, dPm_2/dY_2 = \alpha MC_2 + (\beta+r\alpha)M_2 \, dPm_2/dX_2$

This can be rewritten as:

$\frac{1-t_1}{\alpha}MR_1 + (\frac{\beta}{\alpha} + r)Pm_2 - (\frac{\beta}{\alpha} + r)M_2 \, dPm_2/dY_1 + (\frac{\beta}{\alpha} + r)M \, dPm_2/dY_2 = \frac{1-t_1}{\alpha}MC_1 +$

$$(\frac{\beta}{\alpha} + r)Pm_2 + (\frac{\beta}{\alpha} + r)M_2 \, dPm_2/dX_1 - (\frac{\beta}{\alpha} + r)M_2 \, dPm_2/dX_2 = MR_2 = MC_2$$

Replacing $\alpha$ with $1-t_2-bt_1+c$ and $\beta$ with $t_1-t_2-bt_1+c$:

$$\frac{1-t_1}{1-t_2-bt_1+c}MR_1 + [\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]Pm_2 - [\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]M_2\frac{dPm_2}{dY_1} +$$

$$[\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]M_2\frac{dPm_2}{dY_2} = \frac{1-t_1}{1-t_2-bt_1+c}MC_1 + [\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]Pm_2 +$$

$$[\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]M_2\frac{dPm_2}{dX_1} - [\frac{t_1-t_2-bt_1+c}{1-t_2-bt_1+c} + r]M_2\frac{dPm_2}{dX_2} = MR_2 = MC_2$$

Where firm 2 is the exporter no tariff barrier exists. Assuming $Pm_1 = Pm_2$ and letting $r = 0$ the profit maximizing condition equally applies to the case where firm 2 is the exporter. Since we are interested in the effects of combined taxes and tariffs only the case where firm 1 is the exporter is examined.

## Appendix VII.1

### Profit Maximization Under No Trade Barriers

$$TT_1 = P_1Y_1 - C_1 - Pm_{12}M_{12} + Pm_{21}M_{21} - Pm_{13}M_{13}$$

$$TT_2 = P_2Y_2 - C_2 + Pm_{12}M_{12} - Pm_{21}M_{21} - Pm_{23}M_{23}$$

$$TT_3 = Pm_{13}M_{13} + Pm_{23}M_{23} - C_3$$

where $Pm_{ij} M_{ij}$ is the value of i's imports from j i,j= 1, 2, 3 $\quad$ i $\neq$ j

$\quad$ $C_i$ is the cost of producing $X_i$ $\quad$ i = 1, 2, 3

Constraints: (1) $X_1 + X_2 = Y_1 + Y_2 = X_3 = Y_3$

$$(2) \quad M_{21} = X_1 - Y_1$$

$$M_{12} = X_2 - Y_2$$

$$\left. \begin{array}{l} M_{13} = X_1 \\ \\ M_{23} = X_2 \end{array} \right\} \quad \begin{array}{l} \text{One unit of input is required to} \\ \text{produce one unit of output.} \end{array}$$

The goal of the corporation is to maximize total profits.

$$L_{TT} = P_1Y_1 - C_1 + P_2Y_2 - C_2 - C_3 + \lambda(X_1 + X_2 - Y_1 - Y_2)$$

$$\left. \begin{array}{l} \partial L/\partial Y_1 = MR_1 - \lambda = 0 \\ \\ \partial L/\partial X_1 = -MC_1 - MC_{13} + \lambda = 0 \\ \\ \partial L/\partial Y_2 = MR_2 - \lambda = 0 \\ \\ \partial L/\partial X_2 = -MC_2 - MC_{23} + \lambda = 0 \end{array} \right\} \quad \lambda = MR_1 = MC_1 + MC_{13} = MR_2 = MC_2 + MC_{23}$$

Note that the marginal cost of producing raw materials for firm 1 equals the marginal cost of producing raw materials for firm 2 equals the marginal cost of producing $X_1 + X_2 = X_3$. So that $MC_{13} \equiv MC_{23} \equiv MC_3$. The condition can therefore be rewritten as:

$$MR_1 = MC_1 + MC_3 = MR_2 = MC_2 + MC_3$$

This condition implies three substatements each of which must be satisfied in order to maximize total profits:

(1) $MR_1 - MC_1 = MC_3 = MR_2 - MC_2$ or $NMR_1 = NMR_2 = MC_3$

(2) $MR_1 = MR_2$

(3) $MC_1 = MC_2$

Appendix VII.2

Profit Maximization Where Country 2 Levies a Tariff on

Imports of Finished Goods

$$TT_1 = P_1 Y_1 - C_1 - Pm_{12} M_{12} + Pm_{23} M_{23} - Pm_{13} M_{13}$$

$$TT_2 - P_2 Y_2 - C_2 + Pm_{12} M_{12} - (1+r) Pm_{21} M_{21} - Pm_{23} M_{23}$$

$$TT_3 = Pm_{13} M_{13} + Pm_{23} M_{23} - C_3$$

where r is the rate of import duty levied on firm 2's imports from firm 1.

$$L_{TT} = P_1 Y_1 - C_1 + P_2 Y_2 - C_2 - C_3 - rPm_{21} M_{21} + \lambda (X_1 + X_2 - Y_1 - Y_2)$$

$$\partial L / \partial Y_1 = MR_1 + rPm_{21} - rM_{21} \, dPm_{21}/dY_1 - \lambda = 0$$

$$\partial L / \partial X_1 = -MC_1 - MC_3 - rPm_{21} - rM_{21} \, dPm_{21}/dX_1 + \lambda = 0$$

$$\partial L / \partial Y_2 = MR_2 - rM_{21} \, dPm_{21}/dY_2 - \lambda = 0$$

$$\partial L / \partial X_2 = -MC_2 - MC_3 - rM_{21} \, dPm_{21}/dX_2 + \lambda = 0$$

The general profit maximization condition is therefore:

$$MR_1 + rPm_{21} - rM_{21} \, dPm_{21}/dY_1 = MC_1 + MC_3 + rPm_{21} + rM_{21} \, dPm_{21}/dX_1 =$$

$$MR_2 - rM_{21} \, dPm_{21}/dY_2 = MC_2 + MC_3 + rM_{21} dPm_{21}/dX_2$$

With a fixed transfer price ($Pm_{21}$) the condition reduces to:

$$MR_1 + rPm_{21} = MC_1 + MC_3 + rPm_{21} = MR_2 = MC_2 + MC_3$$

This contains three separate subconditions necessary for profit maximization:

(1)  $MR_1 - MC_1 = MC_3 = MR_2 - MC_2$ <u>or</u> $NMR_1 = MC_3 = NMR_2$

(2)  $MR_1 + rPm_{21} = MR_2$

(3)  $MC_1 + rPm_{21} = MC_2$

<u>Note</u>

A variable transfer price such as $AR_1$, $AC_1$ or $MC_1$, with a positive $Pm_{21} - M_{21}$ relationship would raise the net marginal revenue of firm 1. The $\Sigma NMR$ curve would therefore shift to the right causing an expansion in total output and sales. This is because as firm 1's exports to firm 2 decline as a result of the tariff the transfer price also declines further reducing the tariff bill. As a result the net decline in exports is somewhat less and the demand for the primary product somewhat larger. A negative $Pm_{21} - M_{21}$ relationship ($AR_2$, $AC_2$ or $MC_2$) would cause a decline in total output and sales for the opposite reason.

Appendix VII.3

Profit Maximization Where Country 2 Levies a Tariff on

Imports of Raw Materials and Intermediate Goods

$$TT_1 = P_1Y_1 - C_1 - Pm_{12}M_{12} + Pm_{21}M_{21} - Pm_{13}M_{13}$$

$$TT_2 = P_2Y_2 - C_2 + Pm_{12}M_{12} - Pm_{21}M_{21} - (1+r)Pm_{23}M_{23}$$

$$TT_3 = Pm_{13}M_{13} + Pm_{23}M_{23} - C_3$$

where r is the tariff rate charged on firm 2's imports from firm 3

$$L_{TT} = P_1Y_1 - C_1 + P_2Y_2 - C_2 - C_3 - rPm_{23}M_{23} + \lambda(X_1 + X_2 - Y_1 - Y_2)$$

$$\partial L/\partial Y_1 = MR_1 - \lambda = 0$$

$$\partial L/\partial X_1 = -MC_1 - MC_3 + \lambda = 0$$

$$\partial L/\partial Y_2 = MR_2 - rM_{23}\ dPm_{23}/dY_2 - \lambda = 0$$

$$\partial L/\partial X_2 = -MC_2 - MC_3 - rPm_{23} - rM_{23}\ dPm_{23}/dX_2 + \lambda = 0$$

The profit maximizing condition is:

$$MR_1 = MC_1 + MC_3 = MR_2 + rM_{23} \; dPm_{23}/dY_2 = MC_2 + MC_3 + rPm_{23} + rM_{23} \; dPm_{23}/dX_2$$

Under a fixed transfer price this reduces to:

$$MR_1 = MC_1 + MC_3 = MR_2 = MC_2 + MC_3 + rPm_{23}$$

which can be broken into three subconditions:

(1)  $MR_1 - MC_1 = MC_3 = MR_2 - MC_2 - rPm_{23}$ or $NMR_1 = MC_3 = NMR_2 - rPm_{23}$

(2)  $MR_1 = MR_2$

(3)  $MC_1 = MC_2 + rPm_{23}$


## Appendix VII.4

### Profit Maximization Where Country 1 Taxes Pure Profits

$$TT_1 = (1-t)[P_1Y_1 - C_1 - Pm_{12}M_{12} + Pm_{21}M_{21} - Pm_{13}M_{13}]$$

$$TT_2 = (1-bt)[P_2Y_2 - C_2 + Pm_{12}M_{12} - Pm_{21}M_{21} - Pm_{23}M_{23}]$$

$$TT_3 = (1-b't)[Pm_{13}M_{13} + Pm_{23}M_{23} - C_3]$$

where t is the tax rate levied on pure profits; $0 \leq t \leq 1$

b is the fraction of firm 2's profits taxable by country 1; $0 \leq b \leq 1$

b' is the fraction of firm 3's profits taxable by country 1; $0 \leq b' \leq 1$

The goal of the corporation is to maximize $TT_1 + TT_2 + TT_3$.

$$L_{TT} = (1-t)[P_1Y_1 - C_1] + (1-bt)[P_2Y_2 - C_2] - (1-b't)C_3 + (t-b't)Pm_{13}M_{13}$$

$$+ (t-bt)Pm_{12}M_{12} - (t-bt)Pm_{21}M_{21} + t(b-b')Pm_{23}M_{23} + \lambda(X_1 + X_2 - Y_1 - Y_2)$$

$$\partial L/\partial Y_1 = (1-t)MR_1 + (t-b't)M_{13} \; dPm_{13}/dY_1 + (t-bt)M_{12} \; dPm_{12}/dY_1 + (t-bt)$$

$$Pm_{21} - (t-bt)M_{21} \; dPm_{21}/dY_1 - \lambda = 0$$

$$\partial L/\partial X_1 = -(1-t)MC_1 - (1-b't)MC_3 + (t-b't)Pm_{13} + (t-b't)M_{13}\ dPm_{13}/dX_1$$

$$+ (t-bt)M_{12}\ dPm_{12}/dX_1 - (t-bt)Pm_{21} - (t-bt)M_{21}\ dPm_{21}/dX_1 + \lambda = 0$$

$$\partial L/\partial Y_2 = (1-bt)MR_2 - (t-bt)Pm_{12} + (t-bt)M_{12}\ dPm_{12}/dY_2 - (t-bt)M_{21}\ dPm_{21}/dY_2$$

$$+ (b-b')tM_{23}\ dPm_{23}/dY_2 - \lambda = 0$$

$$\partial L/\partial X_2 = -(1-bt)MC_2 - (1-b't)MC_3 + (t-bt)Pm_{12} + (t-bt)M_{12}\ dPm_{12}/dX_2$$

$$- (t-bt)M_{21}\ dPm_{21}/dX_2 + t(b-b')Pm_{23} + t(b-b')M_{23}\ dPm_{23}/dX_2 + \lambda = 0$$

The profit maximizing condition is:

$$(1-t)MR_1 + (t-b't)M_{13}\ dP_{13}/dY_1 + (t-bt)M_{12}\ dPm_{12}/dY_1 + (t-bt)Pm_{21} -$$

$$(t-bt)M_{21}\ dPm_{21}/dY_1 = (1-t)MC_1 + (1-b't)MC_3 - (t-b't)Pm_{13} -$$

$$(t-b't)M_{13}\ dPm_{13}/dX_1 - (t-bt)M_{12}\ dPm_{12}/dX_1 + (t-bt)Pm_{21} +$$

$$(t-bt)M_{21}\ dPm_{21}/dX_1 = (1-bt)MR_2 - (t-bt)Pm_{12} + (t-bt)M_{12}\ dPm_{12}/dY_2$$

$$- (t-bt)M_{21}\ dPm_{21}/dY_2 - t(b-b')M_{23}\ dPm_{23}/dY_2 = (1-bt)MC_2 +$$

$$(1-b't)MC_3 - (t-bt)Pm_{12} - (t-bt)M_{12}\ dPm_{12}/dX_2 + (t-bt)M_{21}\ dPm_{21}/dY_2$$

$$- t(b-b')Pm_{23} - t(b-b')M_{23}\ dPm_{23}/dX_2$$

Where (1) all transfer prices are fixed and (2) firm 1 exports to firm 2, the condition reduces to:

$$(1-t)MR_1 + (t-bt)Pm_{21} = (1-t)MC_1 + (1-b't)MC_3 - (t-b't)Pm_{13} + (t-bt)Pm_{21} =$$

$$(1-bt)MR_2 = (10bt)MC_2 + (1-b't)MC_3 - t(b-b')Pm_{23}$$

which can be broken into three subconditions:

(1)  $(1-t)MR_1 - (1-t)MC_1 + (t-b't)Pm_{13} = (1-b't)MC_3 = (1-bt)MR_2 -$

$\quad\quad (1-bt)MC_2 + t(b-b')Pm_{23}$ $\underline{or}$ $(1-t)[NMR_1] + (t-b't)Pm_{13} =$

$\quad\quad (1-b't)MC_3 = (1-bt)[NMR_2] + (tb-tb')Pm_{23}$

(2) $(1-t)MR_1 + (t-bt)Pm_{21} = (1-bt)MR_2$

(3) $(1-t)MC_1 - (t-b't)Pm_{13} + (t-bt)Pm_{21} = (1-bt)MC_2 - t(b-b')Pm_{23}$

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