THE EFFECTS OF TARIFFS, PARTIAL OWNERSHIP, AND REGULATED TRANSFER PRICING ON PRODUCTION DECISIONS

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CHAPTER I

INTRODUCTION

In 1989 intrafirm trade between the U.S. and other countries accounted for 40.4% of total U.S. merchandise trade, with an estimated value of over $330 billion (Tang, 1993). As of June 1994, the vast majority of tax dollars at issue in the U.S. Tax Court related to intrafirm trade and the transfer price used for tax purposes (Schwartz et al, 1994). The main issue in these cases was the method the multinational used to set transfer prices. The policymakers and multinationals have spent a considerable amount of time and effort trying to develop transfer pricing methods. The relationship between regulated methods and profit maximization could have important current tax policy implications particularly because of the large dollar amounts involved and the lack of agreement between the parties involved (see Secs. 1.1.1 to 1.1.3).

1.1 The Transfer Pricing Problem

The transfer price is the value assigned to goods and services transferred between divisions of a company. The value is sales revenue to the division that transferred the good or services and a cost to the receiving division. When a company has multinational operations these divisions can be in different countries.[1] In the 1970's, taxing authorities, particularly the United States, became concerned with the manipulation of transfer pricesfor tax purposes. Until this time, multinationals used transfer pricing rather easily as a means to shift income between countries thus minimizing global taxes.[2] To minimize taxes, a high transfer price can be used when the transferring division's tax rate is lower thus moving revenues into the low tax country and expenses to the high tax country.

The principle used by the U.S. government, as well as most all of the other members of the United Nations, to determine a transfer price is called the arm's length principle. Sec. 482 of the U.S. Internal Revenue Code gives the IRS the authority to promulgate regulations to allocate income among divisions of a multinational to reflect its true income. Reg. Sec. 1.482-1(b) defines the standards used in transfer pricing.

> "In determining the true taxable income of a controlled taxpayer, the standard to be applied in every case is that of a taxpayer dealing at <u>arm's length</u> with an uncontrolled taxpayer. A controlled transaction meets the <u>arm's length</u> standard if the results of the transaction are consistent with the results that would have been realized if uncontrolled taxpayers had engaged in the same transaction under the same circumstances (<u>arm's length</u> result)." (emphasis added)

The arm's length principle has been criticized based on the nature of the multinational. For example, one reason a multinational exists is because of the economies of scale they can find through related operations (Chandler et al, 1995). The arm's length principle requires the multinational to act as though its divisions *are not* related even though its divisions *are* related.

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[1] The divisions of the multinational are called related parties under Sec. 482. According to Reg. Sec. 1.482-1(a)(3) the divisions must be "owned or controlled directly or indirectly by the same interests". The rules look to the "reality" of control not the form.

[2] Vaitsos (1974) found that multinationals were overstating transfer prices by an average of 155 percent in the pharmaceutical industry, 25 percent in the chemical industry and 40 percent in the rubber industry.

The three key players in the transfer pricing arena are the multinational, the regulators and the court. To fully comprehend the complexities of this problem, the transfer pricing background and goals of each player are investigated below.

1.1.1 Multinationals

Multinationals exist because of market imperfections that are used to the firm's advantage. Some of the most common market imperfections are labor cost and availability differences, location and transportation advantages, technological differences and political advantages such as taxes, tariffs, duties, etc. (Leitch & Barrett, 1992). Transfer pricing is used to further these advantages. In 1991 Business International Corporation and Ernst & Young undertook a study of transfer pricing. Through use of a survey and numerous interviews, the authors of this study concluded that the following eight items were key objectives of corporate transfer pricing policies (in no particular order of priority):

1) Moving funds internationally,
2) Minimizing taxes,
3) Minimizing tariffs,
4) Avoiding exchange controls and quotas,
5) Minimizing exchange risks,
6) Increasing shares of profits from joint ventures,
7) Optimizing managerial incentives and performance evaluations and
8) Minimizing customs duties and value-added tax (VAT) exposure.

1.1.2 Regulators (Congress and the IRS)

The taxation of multinationals can be thought of as a zero-sum game. Only a certain amount of tax payments exists and each country is scrambling to obtain its "fair" share. The fear that the U.S. was not receiving its fair share resulted in members of both houses of Congress requesting the General Accounting Office (GAO) to research this issue. The GAO researchers did find a majority of multinationals paying no tax in 1991; however, they could not entirely tie this finding to transfer pricing abuses (GAO, 1995).

Bad feelings are not new in the area of transfer pricing. The IRS has long felt that multinationals were hiding information on their transfer pricing practices. A 1988 study of transfer pricing by the Treasury Department, called "The White Paper," revealed the perception on the part of the IRS auditors that multinationals were purposely delaying audits and even refusing to make documentation available to keep from having their transfer pricing methods audited.[3]

1.1.3 The Courts

Throughout the 1970's and 80's the courts did their best to adhere to the arm's length standard even when it resulted in allocations that did not fit economic reality. True arm's length results are found through comparable sales such as in a competitive market place. Since multinationals often do not operate under perfect competition, any comparables that were found probably had been affected by the multinational.[4]

In the 1990's the courts realized that where a comparable transaction clearly did not reflect economic reality, some other means would have to be used. Cases were solved by the court arbitrarily assigning an amount, usually between what the taxpayer

[3]As of 1992 the IRS continues to feel that multinationals are hiding their transfer pricing methods and purposes, in spite of numerous documentation regulations. Interview with Tax Counsel James Mogle *Transfer Pricing Report* 479 (1992).

[4] This problem became apparent in cases such as *Sunstrand Corp. v. Commissioner*, 96 T.C. 226, *Merck & Co., Inc., v. United States*, 24 Cl. Ct 73, 91-2 USTC 50,456 and *Bausch & Lomb, Inc., v. Commissioner*, 933 F.2d 1084 (Avi-Yonah, 1995).

wanted and what the IRS wanted, and calling it arm's length.[5] Since no one method or side consistently wins the court cases, no definitive conclusion on setting a transfer price has been made. The main conclusion is, absent comparables, the courts look to the most reasonable allocation that appears to reflect economic reality. See Table I for a listing of the most recent court cases with the court's decisions.

1.2 Prior Studies of Transfer Pricing

The vast majority of transfer pricing studies have been empirical studies examining how the multinational sets a transfer price and what factors affect this decision.[6] The rest are normative studies using economic-based and goal programming methodologies. They explore how the multinational should set the transfer price and have found that the profit maximizing transfer price results in resource allocation distortions. The study of Halperin & Srinidhi (1987, 1991 and 1997) represents the only analytical study to combine profit maximization and transfer pricing by examining specific transfer pricing methodologies.

1.3 Purpose and Research Issues Addressed in the Study

The primary purpose of this study is to determine the effect of tariffs, partial ownership, taxes and regulated transfer pricing methods on the transfer price and resource allocation decisions of the multinational. The research questions are addressed using the theory of profit-maximization. This study considers the impact of tariffs and partial ownership on a firms' productions decisions when faced with a regulated transfer pricing method. The following questions are addressed in this study.

[5] In *Perkin-Elmer Corp., 66 T.C.M. (CCH) 634*, the court decided part of the issues under consideration completely on the taxpayer's side because neither side, taxpayer nor IRS, had actually proven their case.

1. What is the impact of tariffs, taxes and regulated methods on a firms' production decisions? To answer this question, first tariffs are analyzed, second taxes are added to the analysis and finally regulated transfer pricing methods are introduced.

2. What is the impact of less than full ownership, taxes and regulated transfer pricing methods on the firms' production decisions? To answer this question, first benchmark resource allocations are found under less than full ownership, second, taxes are added to the analysis and finally, regulated methods are introduced. This analysis is done under two different scenarios: when a market price does exist and when it does not exist.

Analytical methodology has been used in tax research for many years. Analytical research is implemented by making certain assumptions about economic behavior and the issue being studied. Mathematics is used as a tool to make logical conclusions that hold based on the assumptions. Analytical research is used "to get insights into how some part of the tax law may affect economic behavior when data is nonexistent or unavailable". Much of the tax research done by accountants makes use of tests or principles developed mathematically.[7]

1.4 Contribution of the Study

The primary contribution of this study is the extension of the theory of transfer pricing with regulated transfer pricing methods. This study is different from the Halperin and Srinidhi study because it first extends their model to tariffs and then modifies it to allow partial ownership. As previously mentioned in Sec. 1.1.1, a study on the key objectives of corporate transfer pricing policies found both tariffs and partial ownership

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[6] Leitch & Barrett (1992) and Borkowski (1996) review these empirical studies.

[7] The information in this paragraph was based on Chapter 1 Analytical Methodology in Tax Research by Robert Halperin, in *A Guide to Tax Research Methodologies*.

(through joint ventures) to be two of these objectives (Business, 1991). Therefore, these two variables are also important to the theory of transfer pricing.

This study makes a contribution, through the tariff extension, by determining a tariff that could be used by domestic governments to remove resource allocation distortions while keeping regulations intact. In the partial ownership analysis, this study makes a contribution by determining the ownership percentage multinationals should use to obtain increased profits from tax differentials between countries.

1.5 Organization of the Study

The next chapter reviews the current transfer pricing methodologies and their backgrounds. The third chapter contains a literature review of other analytical studies of profit maximizing transfer prices. The fourth chapter explains the basic transfer pricing model used in the analytics. The fifth and sixth chapters contain the answers to the research questions listed previously involving tariffs and partial ownership, respectively. The final chapter includes a summary, extensions and limitations of this study.

Four appendices follow Chapter VII. Appendix A contains numerical illustrations of the transfer pricing decision with tariffs. Appendix B provides numerical illustrations of the transfer pricing decision with a less-than wholly owned subsidiary. Appendix C contains the following: Tables I and II contain background information on transfer pricing from court cases and firms; Table III provides numerical examples of three transfer pricing methods; Tables IV to XIII contain conclusions of the regulated transfer pricing methods analysis; and finally for ease of reading, Table XIV summarizes the notation used in the study.

CHAPTER II

TRANSFER PRICING METHODOLOGIES

Five regulatory transfer pricing methods exist for use by multinationals. These methods are outlined in the federal tax regulations. Section 2.1 explains the five: (1) Comparable Uncontrolled Price, (2) Resale Price Method, (3) Cost Plus Method, (4) Comparable Profits Method and (5) Profit Split Method. Section 2.2 examines the background and differences in these methods.

2.1 Transfer Pricing Methodologies - Regulations

Reg. Sec. 1.482-3, outlines five different transfer pricing methods that are used to determine the taxable income for a transfer of tangible property. The first method is the <u>comparable uncontrolled price method</u> (CUP method). This method involves using the market price of the good as the transfer price between divisions of the multinational (called controlled parties). The problem encountered in this method is finding a market price for the good being transferred. Quite often transfers between subsidiaries involve goods that do not have a ready market. The IRS recognizes this problem and instructs the multinational to find comparable transactions by unrelated parties (called uncontrolled transactions) and adapt them to their particular circumstances. If necessary the price is adjusted for several different factors listed in Reg. Sec. 1.482-3(b)(2)(ii)(B). This method can become rather difficult unless a ready market exists for the good being transferred.

The second method, called the resale price method, is used when a ready market for the intermediate product does not exist. Under this method the transfer price is found by subtracting a markup from the selling price of the final good. This markup is calculated by multiplying the final product's selling price by the gross profit percentage (gross profit/sales) which is earned by the buying/reselling division on similar final products in uncontrolled transactions. As under the first method, the transaction is analyzed and possible adjustments are made according to the differences between the two transactions. The resale price method is recommended when the buying/reselling division does not add substantial value to the product.

The third method is the cost plus method. Under this method the transfer price is calculated by adding a gross profit to the foreign affiliate's cost of producing the good. The gross profit is found by multiplying the cost by the gross profit markup (gross profit/cost of sales) earned by the selling/manufacturing division on similar intermediate products in uncontrolled transactions. Once again the uncontrolled transaction is analyzed and adjustments made based on the differences. This method is recommended if the most similar intermediate product is found in the selling/manufacturing division.

In the fourth method, the comparable profits method, profit level indicators from third parties are used to decide whether the profit or loss in a controlled transaction is arm's length. The method tests whether a controlled party is making approximately the same profit as uncontrolled parties. Profit level indicators specifically mentioned in the regulations are: (1) operating profits/operating assets, (2) operating profits/sales and (3) gross profit/operating expenses.

In the fifth method, the profit split method, two different allocation methods are introduced: the comparable profit split method and the residual profit split method. In the comparable profit split method the operating profit of all controlled parties is allocated on the basis of the allocation of profits between uncontrolled parties engaging in similar transactions. In the residual profit split method the first step is to find the rate of return, earned by uncontrolled similar parties, on routine business activities and apply the rate to the transactions of related parties. This is done to give every related party in the transaction an income amount based on its routine contributions to the relevant business activity. The second step is to assign the residual or remaining profit to each related party based on their relative contributions.

2.2 Background of Transfer Pricing Methodologies

As of 1994, the first three methods discussed above were the primary methods used for tax purposes in the U.S. An item included in the Treasury Department's 1988 "White Paper" was a survey of IRS examiners concerning their experiences with transfer pricing cases. A question in the survey concerned which method the examiners used to make adjustments in their transfer pricing cases. In proposing tangible property adjustments, 31% used the CUP method, 18% the resale price method, 37% the cost plus method and 14% an 'other' method. Tang (1993) did a survey of 143 multinationals. Table II includes the per method percentage results for both domestic and international transfers. Since the Tang study does not make a distinction between methods for tangible and intangible property, a direct comparison is not possible. However, it does appear that, at the time of these studies, a cost plus type method is the most widely used method followed by the CUP method (market based) and the resale price method (adjusted market price).

In the 1990's both the United States and the Organization for Economic Cooperation and Development (OECD) added the fourth and fifth methods, the comparable profits and profit split methods.[8] Since the final U.S. regulations just came out in July of 1994, not much actual work has been done on these two methods.[9] Both of these methods involve the use of third-party (competitor's) information to perform the calculations. Both methods were designed to be used for intangible property although there is no specific disallowance for their use for tangible property.

[8] Many other countries including Canada, Japan and South Korea also base their transfer pricing regulations on these five methods. In addition all of these countries and the U.S. allow the multinational to use another reasonable method even if not detailed out in the tax code. However the multinational must be ready to defend their method and show how it achieves an arm's length result better than the five detailed methods.

[9] Halperin and Srinidhi (1996) analytically modeled these two methods for intangible property see literature review.

CHAPTER III

LITERATURE REVIEW

This study investigates the impact of partial ownership and tariffs on the resource allocations of a firm. The transfer pricing decision has been studied in both the accounting and economics literature. The main body of the research has been on the incentive effects of transfer pricing. A much smaller amount has been done on the multinationals reaction to regulated transfer pricing methods. The areas pertinent to this study include: transfer pricing and ownership methods, transfer pricing and tariffs and transfer pricing and regulated methods. This literature review contains summaries of studies in these particular areas of interest.

3.1 Transfer Pricing and Partial Ownership

Kant (1988)

The objective of this study was to examine the multinational's transfer pricing strategy when its subsidiary was less than wholly owned and no viable tax constraints existed. Using profit maximization theory in a partial equilibrium setting, he modeled a multinational that faced both taxes and tariffs. Where a low transfer price was desired for a wholly-owned subsidiary or branch, a high transfer price was desired for a less than wholly-owned subsidiary.[10] This result holds as long as the ownership percentage multiplied by one plus the tariff is less than one. Since one plus the tariff is always greater than one, this result is more likely for lower ownership percentages. The conclusion was reached that, with the introduction of partial ownership, desiring a high transfer pricing is more likely than has been suggested in prior literature.

3.2 Transfer Pricing and Tariffs

Horst (1971), Samuelson (1982), and Eden (1985, 1991) are examples of articles in the economic literature that include tariffs in their analysis. Each one of these articles is reviewed next. In all of these studies, a profit maximizing multinational was modeled in a partial equilibrium setting.

Horst (1971)

The objective of this study was to characterize the optimal production and transfer pricing strategy for a multinational and then show the impact of a change in the tax or tariff rate on this strategy. The model in this study included taxes, tariffs and an exogenous transfer price. An exogenous transfer price is one that is not affected by production volume decisions. The findings in this study depended on whether selling prices for final goods sold by the multinational were independent and whether they faced increasing or decreasing marginal costs. Overall the following two conclusions were made. Under decreasing marginal costs, increasing the tariff affects not only the volume of imports but also the direction of imports. Second, multinationals generally desire a low transfer price and a high tariff policy renders tax policy impotent.

[10] As previously mentioned, a low transfer price is desired when the transferring divisions tax rate is higher.

Samuelson (1982)

The objective of this study was to examine the changes in production decisions when the transfer price is endogenous rather than exogenous. An endogenous transfer price is one that is affected by production volume decisions. Taxes and tariffs were included in the model of the multinational. Samuelson found that if a high transfer price is desired, imports are increased more than in the exogenous case. The results for a low transfer price were ambiguous. Samuelson concluded that if multinationals understand their influence over arms length prices then governments should take this into account in formulating policy.

Eden (1985)

The objective of this study was to extend the existing transfer pricing models, reviewed above, to include horizontal and vertical integration, an analysis of changes in tax, tariffs and exchange rates on the transfer price, the welfare effects of tariffs on intra-firm trade and the efficiency of transfer price manipulation in response to tariffs and corporate tax differentials. Eden's model included taxes, tariffs and exchange rates. The primary finding of interest in this study, concerns the impact the tariff has on the transfer price set by the multinational. The decision to set a low or high transfer price depends on the relationship between the tax rate(s) and the tariff(s). If the tax rate is higher in the importing country, the transfer price is set at the highest possible value.[11] If the tax rate in the exporting country is higher than the combination of the tax rate and tariff in the importing country, the transfer price is the lowest possible. This could happen whether the importing country's tax rate was higher or lower than the exporting country's.

[11] Although this results in a high value for tariffs, it also results in the highest possible expense in the high tax country and highest possible revenue in the low tax country.

Kant (1988)

In Kant (1988), the tariff prevented the results from always being opposite between a wholly owned and less-than wholly owned subsidiary (see discussion in Sec. 3.1). Clearly, the presence of a tariff has an impact on the transfer pricing decision. All of these prior studies, involving tariffs resulted in corner solutions, highest or lowest possible for the transfer price. With the introduction of regulated methods in this study, the results for the combination of taxes and tariffs are not always corner solutions.

Eden (1991)

The objective of this study was to determine the impact of numerous changes in the tax and tariff policies in the U.S. and Canada on U.S. multinationals with Canadian subsidiaries production decisions. Eden's model included taxes, tariffs, exchange rates and endogenous transfer prices. The analysis showed that, prior to the changes, the United States and Canada subsidized new manufacturing investments through discouraging dividend remittances and encouraging the use of low transfer prices. After the changes, the tax differential widens but regulations tightened and the incentive for manipulations is reduced. Eden concludes that income transfers from Canada to the United States should increase.

3.3 Transfer Pricing and Regulated Methods

Halperin & Srinidhi (1987, 1991, 1996)

The objective of each of these studies was to explore how multinationals react to transfer pricing regulations. Using profit maximization theory in a partial equilibrium framework, each of the three studies include taxes and regulated transfer pricing methods. The first two studies model the resale price and cost plus methods. The first study is in a centralized organizational framework; the second in a decentralized framework. The third study models comparable uncontrolled transaction and comparable profit methods for intangible property transfers. All three studies find resource allocation distortions occur when regulated methods are introduced. In addition the distortion is in the same direction in each study and reflects income shifting to minimize taxes by using a high transfer price when the product originates in a low tax country and vice versa in a high tax country. The Halperin & Srinidhi (1987) basic transfer pricing model is used in this study and is reviewed in Sec. 4.1.

3.4 Chapter Summary

The purpose of this chapter was to review the analytical transfer pricing studies in the main areas of interest to this study: partial ownership, tariffs and regulated methods. While much work has been done in this area, much more remains to be done. This is particularly true for the area of regulated methods. During the late 1980's and into the 90's, the IRS has concentrated on enforcing the rules in this area. Much of the economic literature assumes the multinational has a great deal of latitude in devising a transfer price (Kant, 1988). This assumption is becoming more and more unreasonable. Because of the increased enforcement, this study should become a timely addition to the currently available knowledge concerning transfer pricing.

CHAPTER IV

HALPERIN & SRINIDHI (1987)

The model used in this study was developed in the Halperin & Srinidhi (1987) (H&S) study. The purpose of the H&S study was to explore how multinationals react to regulated transfer pricing methods. As was mentioned in the prior chapter, the model in H&S used profit maximization theory, which is from the perspective of the firm, and was done in a partial equilibrium setting. In this chapter, first the H&S study is reviewed. Then the H&S model is presented in mathematical form.

Sec. 4.1 Review of H&S Study

This study examined the effects of the resale price method and the cost plus method on the multinationals optimal resource allocation decisions. The effects were found by comparing the allocation decision under regulated methods to the allocation decisions made with no regulated methods. H&S found distortions when the regulated methods were used and the tax rates were different between countries.

H&S assumed a U.S. based multinational with a wholly-owned manufacturing division in a foreign country and a distribution division in the United States. The manufacturing division produces an intermediate product and transfers it to the distribution division. The distribution division incurs additional costs such as assembly, packaging, distribution or marketing costs and then sells the final product to an unrelated party.

The multinational operates in an imperfectly competitive market and can affect the market price and thus the transfer price through production decisions, i.e., selling less of the product in the external market causes the selling price, and thus marginal revenue, to rise. The multinational also operates under a centralized decision-making framework. The transfer price in the model is not used to evaluate division performance.

First, H&S analyzed the multinational with no taxes and found that the transfer price was arbitrary and the multinational should produce where marginal revenue equals marginal cost. Second, H&S introduced taxes to the model and found that when the tax rates were equal the result was the same as under no taxes. If the rates were not equal, the results depended on which rate was higher. If the foreign rate was lower the multinational sets the transfer price to transfer all profit to the foreign country. The opposite was true if the foreign rate was higher. As long as the multinational could set the transfer price without regulations no production/quantity distortions existed. Upon the introduction of regulated methods, resale price and cost plus methods, resource allocation distortions were found.

Under the resale price method, the transfer price is the final product's selling price minus a markup. The markup is obtained by multiplying the final product's selling price by the gross profit percentage earned by the distributing division on similar final products in uncontrolled transactions.[12] An uncontrolled transaction is one that is between the distribution division and an unrelated entity. When the foreign rate is lower the

[12] The demands for the controlled product and the similar product are assumed independent in both the resale price and cost plus method.

multinational has an incentive to set a high transfer price. This is accomplished through the production decisions of both the controlled product and the similar final product. Production is restricted at the manufacturer to drive up marginal revenue and the multinational overproduces the similar final product to reduce the gross profit percentage thus keeping the transfer price high. The opposite results occur if the manufacturing division has the higher tax rate.

Under the cost plus method, the transfer price is calculated by adding a gross profit to the foreign affiliate's cost of producing the good. The gross profit is found by multiplying the cost by the gross profit markup earned by the manufacturing division on similar intermediate products in uncontrolled transactions. With a lower foreign tax rate the multinational still desires a high transfer price. The multinational restricts trade on the controlled product to increase marginal revenue however the multinational now underproduces the similar intermediate product to increase the gross profit markup and thus keep the transfer price high. The opposite occurs if the manufacturing division has the higher tax rate.

4.2 Mathematical Explanation of H&S Model

To implement the analysis first a scenario is developed of the firm including an equation representing firm profit. Then, the profit equation is maximized subject to any definitions or constraints given in the scenario. Assume a U.S. based multinational *(d)* with a wholly-owned subsidiary (*m*) in a foreign country.[13] Division *m* produces an

[13] *d* stands for distributor and *m* stands for manufacturer.

intermediate product, q_m, which is transferred to *d*, converted into a final product and sold. The intermediate product is manufactured using one factor of production x_m, whose unit cost is p_m. The term $q_m = F(x_m)$, where $F(\cdot)$ is *m*'s production function. Decreasing marginal productivity is assumed:

$dF/dx_m > 0$ and $d^2F/dx^2_m < 0$.

Division *d* purchases q_m at transfer price, r, and then transforms q_m into the final product, q_d, using an additional factor of production, x_d, whose unit cost is p_d. The term $q_d = G(q_m, x_d)$, where $G(\cdot,\cdot)$ is *d*'s production function. Division *d* also faces declining marginal productivity of both factors of production:

$\partial G/\partial q_m, \partial G/\partial x_d > 0; \partial^2 G/\partial q^2_m, \partial G^2/\partial x^2_d < 0, \partial^2 G/\partial q_m \partial x_d < 0.$

Assume that q_m and x_d are normal factors of production. The final product, q_d, is sold in an imperfectly competitive market and yields a revenue $R_d(q_d)$. $F(\cdot)$ and $G(\cdot,\cdot)$ are independent functions.

With no taxes the firm's problem is:

$$\underset{x_m,\, x_d,\, r}{\text{Maximize}} \quad (R_d(q_d) - p_d x_d - r q_m) + (r q_m - p_m x_m)$$

subject to:

$$q_d = G(q_m, x_d), \text{ and}$$

$$q_m = F(x_m). \tag{4.1}$$

The first step in solving this problem is to find out whether the transfer price is used to maximize profit. This is done below by holding all variables except the transfer price, r, constant:

$$\partial\pi/\partial r = 0 \text{ (both terms involving r cancel)} \tag{4.2}$$

Equation (4.2) shows that absent any constraints the transfer price is arbitrary (no unique solution exists). Next each one of the factors of production are allowed to vary.

$$\partial\pi/\partial x_m = R'_d\ \partial G/\partial q_m\ dF/dx_m = p_m \tag{4.3}$$

$$\partial\pi/\partial x_d = R'_d\ \partial G/\partial x_d\ = p_d \tag{4.4}$$

These equations are the benchmark equations to which many other equations in Chapter 5 are compared. In words, equations (4.3) and (4.4) reveal that the firm should operate where marginal revenue equals marginal cost.

Under differential taxation, with no transfer pricing regulations the firm's problem is:

Maximize $\qquad \tau_d(R_d(q_d) - p_d x_d - r q_m)$

$x_m, x_d, r \qquad + \tau_m(r q_m - p_m x_m)$

subject to:

$$q_d = G(q_m, x_d), \text{ and}$$

$$q_m = F(x_m). \tag{4.5}$$

where

τ_m = 1 - effective tax rate of *m* division

τ_d = 1 - effective tax rate of *d* division.

If the U.S. tax rate is higher than the foreign tax rate, absent any regulatory constraints, the multinational sets a high transfer price so that all profits are in the *m* division. The following is the high transfer price:

$$r = (R_d(q_d) - p_d x_d)/\, q_m \tag{4.6}$$

Substitution of equation 4.6 and the constraints into equation 4.5 results in the following profit function:

$$\pi = \tau_m\, [R_d\{G(q_m, x_d)\} - p_d x_d - p_m x_m] \tag{4.7}$$

The first order conditions for equation 4.6 are the same as benchmark equations 4.3 and 4.4.

If the U.S. tax rate is lower, the multinational sets a low transfer price and all profit is in the *d* division. The transfer price is:

$$r = p_m x_m\, / q_m. \tag{4.8}$$

Substitution of the transfer price in equation 4.8 and the constraints into equation 4.5 results in the following profit function:

$$\pi = \tau_d\, [R_d\{G(q_m, x_d)\} - p_d x_d - p_m x_m] \tag{4.9}$$

The first order conditions for equation 4.9 are the same as benchmark equations 4.3 and 4.4. Differential taxation by itself does not cause resource allocation distortions.

Similar to the H&S study this study begins with the basic model with no taxes and uses it to make comparisons with taxes and regulated methods. The resource allocation distortion is found by this comparison. The primary difference between this study and the H&S study is the introduction of tariffs to the model and then the relaxation of the full ownership assumption. As noted previously in Sec. 1.4, tariffs and partial ownership are important variables to the multinational.

4.3 Chapter Summary

This chapter presented the basic transfer pricing model used in this study. The objective of this study is to extend the basic model to consider tariffs and modify it to allow for partial ownership. As the theory of the transfer pricing decision in a regulated world with prescribed methodology is still in its infancy, this paper contributes by expanding the existing theory.

CHAPTER V

TARIFFS

Tariffs are an important variable to consider for several reasons. First, the magnitude of tariffs collected and the potential high rates make this an important variable. In 1996 the U.S. Customs Service collected $22 billion in revenues. The average tariff is currently around 5%, however some individual rates are much higher. For example, tariffs are 151.2% for low-priced watch parts, 458.3% for tobacco stems, and 67% on some shoe imports (Bovard, 1998). Second, tariffs are important because they alone can change results as seen in the Kant (1988) study discussed in the literature review. Third, tariffs are important to the multinational as shown in the study by Business International Corporation and Ernst &Young introduced in Sec. 1.1. The study finds minimizing tariffs is one of the key objectives of corporate transfer pricing policies (Business, 1991).

As discussed in the literature review, tariffs have been a part of the transfer pricing literature for quite some time. However, no study to date has examined the impact of a tariff and a regulated transfer pricing method combined. The analysis of tariffs and taxes with regulated transfer pricing methods follows these analytical scenarios:

Sec. 5.1: A multinational is examined in a world with tariffs, no taxes and no mandated transfer pricing rules from U.S. Customs or the IRS.

Sec. 5.2: A multinational is examined in a world with tariffs and taxes but still no mandated transfer pricing rules.

Sec. 5.3-4: A multinational is examined in a world with tariffs, taxes and mandated transfer pricing rules from U.S. Customs and the IRS.

The simplest scenario is a multinational in a world with no tariffs, no taxes and no rules. This scenario was explored in Chapter 4 from the results of the H&S study. In this simplest case the transfer price is arbitrary and the multinational produces where marginal revenue equals marginal cost. In this study, division *m* is assumed to be wholly-owned and functions like a cost center. Division *m* is assumed to operate in the low tax country. In addition the assumption is made of no tax benefits to losses.[14] For purposes of this paper, the transfer pricing rules from both U.S. Customs and the IRS are assumed to be identical.

5.1 Tariffs Only

Introducing tariffs causes the firm's problem to be restated from equation 4.1 as follows:

$$\underset{x_m,\, x_d,\, r}{\text{Maximize}} \quad (R_d(q_d) - p_d x_d - r q_m - r q_m t) + (r q_m - p_m x_m)$$

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$r \geq 0$ and

$$t \geq 0 \tag{5.1}$$

where

t = % tariff levied on transfers into the home country.

With the introduction of a tariff, the importing cost of the good is higher. The goal of this analysis is to find the transfer price that maximizes total profit. To find this profit maximizing transfer price, the constraints are substituted into the profit function, equation 5.1. The profit function becomes

$$\pi = R_d(\{G(q_m, x_d)\} - p_d x_d - rq_m - rq_m t) + (rq_m - p_m x_m) \tag{5.2}$$

Next the partial derivative with respect to the transfer price is found.

$$\partial\pi/\partial r = - tq_m \tag{5.3}$$

The term on the right hand side of equation 5.3 is a negative constant since q_m and t are positive. Decreasing the transfer price increases global profit. The transfer price is reduced to the smallest possible value, zero. A transfer price of zero minimizes the tariff. However it also causes division *m* to have a loss. Since division *m* is wholly owned and the goal is to maximize global profit, there is no problem with a loss at the divisional level.

To explore the effect on production decisions, the optimal transfer price of zero is substituted into the profit function, equation 5.1. The resulting profit function is the same

[14] Without this assumption, the analysis has to include multiple periods. This is left for future research.

as equation 4.1. The introduction of tariffs does not cause the multinational to distort production. From this analysis, the following proposition is made.

Proposition 5.1: If tariffs exist without taxes, then no distortions in resource allocations occur from the tariff.

5.2 Tariffs and Taxes Only

With the introduction of taxes, the multinational's problem is now as follows:

$$\underset{x_m,\, x_d,\, r}{\text{Maximize}} \quad \tau_d\,(R_d(q_d) - p_d x_d - rq_m - rtq_m) + \tau_m\,(rq_m - p_m x_m)$$

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$$r \geq 0 \text{ and}$$

$$t \geq 0 \tag{5.4}$$

where

τ_d = 1 - effective tax rate of *d* division and

τ_m = 1 - effective tax rate of *m* division.

The transfer price that maximizes global income is found by substituting the constraints into the profit function, equation 5.4. The profit function becomes:

$$\pi = \tau_d\,[R_d\{G(q_m, x_d)\} - p_d x_d - rq_m - rtq_m] + \tau_m\,(rq_m - p_m x_m) \tag{5.5}$$

Next the partial derivative with respect to the transfer price is found.

$$\partial\pi/\partial r = q_m(\tau_m - \tau_d (1 + t)). \tag{5.6}$$

5.2.1 Case 1 - Arbitrary Transfer Price

In the special case, when equation 5.6 is zero, global profit does not change as the transfer price changes, therefore the transfer price is arbitrary. This special case occurs when either $\tau_m - \tau_d (1 + t)$ or q_m is equal to zero. The term q_m equal to zero means no imports, this is not an economically viable situation and is not explored further. Equation 5.6 is zero when $\tau_m = \tau_d (1 + t)$ or rearranging terms when $t = (\tau_m / \tau_d) - 1$. To explore the effects on production decisions, the tariff defined in the previous sentence is substituted into equation 5.5 and results in the following:

$$\pi = \tau_d [R_d\{G(q_m,x_d)\} - p_d x_d] - (\tau_m p_m x_m) \tag{5.7}$$

The first order conditions are:

$$\partial\pi/\partial x_m = \tau_d /\tau_m(R'_d \, \partial G/\partial q_m \, dF/dx_m) = p_m \tag{5.8}$$

$$\partial\pi/\partial x_d = R'_d \, \partial G/\partial x_d = p_d \tag{5.9}$$

These equations are compared to benchmark equations 4.3 and 4.4. Equation 5.8 above is different from 4.3 by the term τ_d/τ_m. Since $\tau_d/\tau_m < 1$, the term in parenthesis on the left-hand side of equation 5.8 must increase to maintain equality with the right-hand side. Since $F(x_m)$ is increasing at a decreasing rate by definition, as x_m increases the rate at which the factor of production is used, dF/dx_m, decreases. The opposite is also true, as x_m decreases the rate at which it is used, by definition, increases. Furthermore as x_m decreases, q_m decreases causing $\partial G/\partial q_m$ to increase. Thus, decreasing x_m is required to increase the term in parenthesis on the left-hand side of equation 5.8. In other words, imports decrease. This decrease occurs because of the introduction of taxes. Intuitively, when a firm encounters taxes, where possible the selling price increases to cover the increased cost. Under imperfect competition decreasing the supply causes an increase in the selling price. In this model, the supply of the intermediate product is from imports.

Equation 5.9 is the same as benchmark equation 4.4, however the distortion in the *m* division's production function which causes q_m to decrease also causes the factor of production at *d* division, x_d, to decrease assuming no outside market for the good and no inventories of q_m.[15] When x_d decreases $\partial G/\partial x_d$ increases and q_d, decreases. Therefore, equation 5.9 is evaluated at a lower level than benchmark equation 4.4.

In conclusion, when $\tau_m = \tau_d (1 + t)$ imports decrease due to the introduction of taxes and the need for a higher selling price. The transfer price is arbitrary and profits decrease from the level under tariffs only. Equation 5.7 shows the decrease in profits when compared to equation 5.2.

5.2.2 Case 2 - Low Transfer Price Desired

When $\tau_m < \tau_d (1 + t)$, the constant is negative and global profit increases as the transfer price decreases, thus the optimal transfer price is zero. A transfer price of zero

[15] This assumption also means that exports from *m* division equal imports at the *d* division. For simplicity in this paper use of the term imports means both imports and exports.

causes all revenue to be transferred to the higher tax country but at the same times lowers the tariff paid to zero.

To explore the effect on production decisions, the transfer price of zero is substituted into the profit function. The profit function becomes:

$$\pi = \tau_d \, (R_d(q_d) - p_d x_d) - p_m x_m \tag{5.10}$$

The term τ_m disappears because the effective tax rate of the *m* division is zero, thus $\tau_m = 1$.[16] After substitution of the constraints, equation 5.10 becomes:

$$\pi = \tau_d \, [R_d\{G(q_m, x_d)\} - p_d x_d] - p_m x_m \tag{5.11}$$

The first order conditions are as follows:

$$\partial\pi/\partial x_m = \tau_d \, (R'_d \, \partial G/\partial q_m \, dF/dx_m) = p_m \tag{5.12}$$

$$\partial\pi/\partial x_d = R'_d \, \partial G/\partial x_d = p_d \tag{5.13}$$

These equations are compared to benchmark equations 4.3 and 4.4. Equation 5.12 is different from 4.3 by the term τ_d. Since $\tau_d < 1$, the term in parenthesis on the left-hand side of equation 5.12 must increase to maintain equality with the right-hand side. Since $F(x_m)$ is increasing at a decreasing rate by definition, as x_m increases the rate at which the factor of production is used, dF/dx_m, decreases. The opposite is also true, as x_m decreases the rate at which it is used increases. Furthermore as x_m decreases, q_m

[16] The losses belong to the *m* division with the assumption of no tax benefits for losses.

decreases causing $\partial G/\partial q_m$ to increase. Thus, decreasing x_m is required to increase the term in parenthesis on the left-hand side of equation 5.12. Imports decrease because of the introduction of taxes and the need for a higher selling price.

Equation 5.13 is the same as benchmark equation 4.4, however the distortion in the *m* division's production function which causes q_m to decrease also causes the factor of production at *d* division, x_d, to decrease. When x_d decreases $\partial G/\partial x_d$ increases and q_d, decreases. Therefore, equation 5.13 is evaluated at a lower level than benchmark equation 4.4.

In conclusion, when $\tau_m < \tau_d\,(1 + t)$ imports decrease due to the introduction of taxes and the need for a higher selling price. The optimal transfer price is zero and profits decrease from the level under tariffs only. Equation 5.11 shows the decrease in profits when compared to equation 5.2.

5.2.3 Case 3 - High Transfer Price Desired

When $\tau_m > \tau_d\,(1 + t)$, the constant in equation 5.6 is positive and global profit increases as the transfer price increases. How far should the transfer price increase? The optimal transfer price is the one that transfers all profits to the division with the highest tax benefits, in this case τ_m. This transfer price is:

$$(R_d(q_d) - p_d x_d\,) \,/\, q_m(1 + t) \tag{5.14}$$

At a transfer price higher than equation 5.14, a loss occurs in the *d* division causing τ_d = 1. When $\tau_d = 1$, the constant, in equation 5.6, is positive under the condition

$\tau_m > (1 + t)$. Since $\tau_m \leq 1$, this condition is not possible. Therefore the transfer price increases to the point where profit is zero in the *d* division.

While tax savings increase as the transfer price increases, tariff savings decrease as the transfer price increases. The tradeoff between tax and tariff savings is captured in the expression $\tau_d(1 + t)$. The lower tax benefits in the *d* division are inflated by one plus the tariff. This tradeoff is reflected by dividing equation 4.6 by (1 + t) thus deflating the optimal transfer price under taxes alone to find the optimal transfer price under taxes and tariffs.

To explore the effect on production decisions, the transfer price in equation 5.14 is substituted into the profit function in equation 5.4. The profit function becomes:

$$\pi = \tau_m \left[\left(R_d(q_d) - p_d x_d \right) / (1 + t) - p_m x_m \right] \tag{5.15}$$

After substitution of the constraints, equation 5.15 becomes:

$$\pi = \tau_m \left[\left(R_d(\{G(q_m, x_d)\} - p_d x_d \right) / (1 + t) - p_m x_m \right] \tag{5.16}$$

The first order conditions are as follows:

$$\partial\pi/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m = p_m(1 + t) \tag{5.17}$$

$$\partial\pi/\partial x_d = R'_d \, \partial G/\partial x_d = p_d \tag{5.18}$$

These equations are compared to benchmark equations 4.3 and 4.4. Equation 5.17 is different from 4.3 by the term (1 + t), which increases the expression on the right-hand side of equation 5.17. The left-hand side of the equation must increase to maintain equality. For dF/dx_m to increase, x_m must decrease, causing q_m to decrease and $\partial G/\partial q_m$ to increase. Thus decreasing x_m is required to increase the left-hand side of equation 5.17. Imports decrease because of the introduction of taxes.

Equation 5.18 is the same as benchmark equation 4.4, however the distortion in the *m* division's production function which causes q_m to decrease also causes x_d to decrease. When x_d decreases, $\partial G/\partial x_d$ increases and q_d decreases. Therefore equation 5.18 is evaluated at a lower level than benchmark equation 4.4.

In conclusion, when $\tau_m > \tau_d\,(1 + t)$ imports decrease due to the introduction of taxes and the need for a higher selling price. The optimal transfer price is the net marginal revenue of the final product divided by one plus the tariff and profits decrease from the level under tariffs only. Equation 5.16 shows the decrease in profits when compared to equation 5.2. The following proposition combines the results of the production decisions under Secs. 5.2.1 to 5.2.3.

Proposition 5.2: If taxes and tariffs exist, then imports are reduced regardless of the relationship between the taxes and tariffs.

Proof: From Sec. 5.2.1, when $\tau_m = \tau_d\,(1 + t)$ to maintain equality in equation 5.8, x_m was decreased. From Sec. 5.2.2, when $\tau_m < \tau_d\,(1 + t)$ to maintain equality in equation 5.9, x_m was decreased. This was also the conclusion in Sec. 5.2.3, when $\tau_m > \tau_d\,(1 + t)$. A decrease in x_m is a decrease in the intermediate product, q_m, thus, imports decrease.

It is also interesting to note that when $\tau_m > \tau_d\,(1 + t)$ the multinational chooses to set a positive transfer price and thus incur tariff payments even without any government regulation. The government could force this outcome by setting $t < (\tau_m / \tau_d) - 1$. However, as previously discussed, at $\tau_m > \tau_d (1 + t)$ the multinational moves all profit to the *m* division thus paying no domestic taxes. Alternatively the tariff could be set at $t < (\tau_m / \tau_d) - 1$, thus forcing a transfer price of zero. No tariff revenue is incurred but the *d* division pays income taxes on revenue with a zero cost basis for the intermediate product. Possibly a government could decide which tariff is better by looking at which agency does a better job of enforcement. The next step is to add government regulations on the transfer price.

5.3 Resale Price Method

As was mentioned in Sec. 4.1, the resale price method involves subtracting a markup from the selling price of the final product. This markup is obtained by looking at the gross profit percentage of similar final products bought and sold by the *d* division on an uncontrolled basis. Assume that the similar final product, q_u, has total revenue of R_u and total inventoriable cost of C_u. The resale price method states that the transfer price should be:

$$r = [(R_d(q_d)/q_d) - (R_d(q_d)/q_d)((R_u - C_u)/R_u)]\,(q_d / q_m) \qquad (5.19)$$

The term in square brackets in equation 5.19 comes directly from the regulations and q_d / q_m scales the transfer price in terms of q_m. Equation 5.19 simplifies to:

$$r = (R_d(q_d)/q_m)(C_u/R_u) \qquad (5.20)$$

The multinational's problem is:

Maximize $\tau_d\,(R_u - C_u + R_d(q_d) - p_d x_d - rq_m - rq_m t)$

x_m, x_d, q_u $\quad + \tau_m\,(rq_m - p_m x_m)$

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$$r = (R_d(q_d)/q_m)(C_u/R_u) \text{ and}$$

$$t \geq 0. \tag{5.21}$$

After substitution of the constraints and simplification equation 5.21 becomes:

$$\tau_d\,(R_u - C_u - p_d x_d) + (\tau_d - \tau_m)((R_u - C_u)/R_u)\,R_d(\{G(q_m,x_d)\}$$

$$+ \tau_m\,[R_d(\{G(q_m,x_d)\} - p_m x_m)] - \tau_d\,t[R_d\{G(q_m,x_d)\}\,(C_u / R_u)] \tag{5.22}$$

Under the resale price method, the three first order conditions are:

$$\partial\pi/\partial x_m = R'_d\,\partial G/\partial q_m\,dF/dx_m\,[-\,t(C_u/R_u)(\tau_d / \tau_m) +$$

$$((\tau_d / \tau_m) - 1)K_u + 1] = p_m \tag{5.23}$$

$$\partial\pi/\partial x_d = R'_d\,\partial G/\partial x_d\,[-\,t(C_u/R_u) + (1 - (\tau_m / \tau_d))K_u +$$

$$(\tau_m / \tau_d)] = p_d \tag{5.24}$$

$$\partial\pi/\partial q_u = \tau_d(R'_u - C'_u) + (\tau_d\,t - (\tau_m - \tau_d))$$

$$[R_d(q_d)((C_u R'_u - R_u C'_u)/ (R_u)^2)] = 0, \tag{5.25}$$

Where $K_u = (R_u - C_u)/ R_u$, R'_u is q_u's marginal revenue, and C'_u is q_u's marginal cost.

5.3.1 Analysis of first order condition # 1 - Equation 5.23

To find whether conditions are different under taxes and tariffs versus taxes only, equation 5.23 is compared to the benchmark equation with taxes only. The benchmark equation (H&S) is as follows:

$$\partial\pi/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m \, [((\tau_d / \tau_m) - 1)K_u + 1] = p_m \tag{5.26}$$

Equation 5.23 is the same as equation 5.26 except the term $- t(C_u/R_u)(\tau_d / \tau_m)$ which shows the effect of the tariff and is negative. The term in square brackets from equation 5.26, the tax effect, is positive.[17]

Next equations 5.23 and 5.26 are explored to find the direction of any distortions. When K_u, the gross profit percentage of the similar final product, is equal to zero equation 5.26 reduces to benchmark equation 4.3 or no resource allocation distortion. However with the tariffs when the gross profit percentage is equal to zero, C_u/R_u disappears since it is equal to one and equation 5.23, becomes:

$$R'_d \, \partial G/\partial q_m \, dF/dx_m \, [1 - t(\tau_d /\tau_m)] = p_m. \tag{5.27}$$

As long as $t < (\tau_m / \tau_d)$, the term in brackets, from equation 5.27, is less than one but greater than zero. The derivatives, $\partial G/\partial q_m$ and dF/dx_m, have to increase to maintain

[17] This is true as long as the gross profit percentage of the similar product is less than one.

the equality. When x_m decreases, dF/dx_m increases. The decrease in x_m causes q_m to decrease and $\partial G/\partial q_m$ to increase. The decrease in q_m causes a decrease in imports. If $t > (\tau_m / \tau_d)$ then the derivative becomes negative and equality is not possible.

To obtain equality within equation 5.23 without affecting production decisions requires a negative gross profit percentage. Notice that when $- t(C_u/R_u)(\tau_d /\tau_m) + ((\tau_d/\tau_m) - 1)K_u = 0$ then equation 5.23 is identical to equation 4.3 and there are no resource allocation distortions. Since $(\tau_d/\tau_m) - 1$ is negative, the gross profit percentage also has to be negative to even make the above term equal to zero a possibility. A negative gross profit percentage is not economically viable, so no distortion is not viable under these conditions.[18]

As K_u approaches one, which means $C_u = 0$, the term in brackets in equation 5.23 is (τ_d / τ_m). Under this scenario, the term in brackets in equation 5.26 is also (τ_d / τ_m). As K_u approaches one the tariff effect disappears. The tariff effect, the first term in the brackets, becomes smaller negative and the tax effect, the second term in the brackets, becomes larger negative. If the tax effect grows faster than the tariff effect then the whole term in brackets becomes smaller and the derivatives must increase to compensate. If the tax effect grows slower than the tariff effect, then the whole term becomes larger and the derivatives must decrease.

With taxes but no tariffs, as the gross profit percentage approaches one, imports decrease. With tariffs imports have already decreased and as the gross profit percentages

[18] See Proposition 5.6 for the possibility of no additional distortions caused by regulations.

approaches one could decrease even further. This occurs when the absolute value of the tax effect is increasing more than the absolute value of the tariff effect. To discover what happens, the term in brackets from equation 5.23 at a gross profit percentage of zero is compared to the term when the gross profit percentage is one. The term in brackets is $1 - t(\tau_d / \tau_m)$ when the gross profit percentage is zero and (τ_d / τ_m) when the gross profit percentage is one. When $(\tau_d/\tau_m) < 1 - t(\tau_d/\tau_m)$ then imports decrease even further as the gross profit percentage approaches one. If $(\tau_d/\tau_m) > 1 - t(\tau_d/\tau_m)$ then imports increase as the percentage approaches one. Rearranging terms, when $\tau_m > \tau_d (1 + t)$, imports decrease, imports increase when the opposite is true. Tables IV and V in Appendix C, summarize the conclusions of the above analysis.

Sec. 5.3.2 Analysis of first order condition # 2 - Equation 5.24

To examine conditions under taxes and tariffs versus taxes only, equation 5.24 is compared to the benchmark equation with taxes only. The benchmark equation (H&S) is as follows:

$$\partial\pi/\partial x_d = R'_d\, \partial G/\partial x_d\, [(1 - (\tau_m / \tau_d))K_u + (\tau_m / \tau_d)] = p_d \qquad (5.28)$$

Equation 5.24 is different from 5.28 by the term $-t(C_u / R_u)$ which shows the effect of the tariff and is negative. Assuming $K_u < 1$, the tax only term in equation 5.28 is positive.

Next equations 5.24 and 5.28 are explored to find the direction of any distortions. When K_u equals zero equation 5.28 is (τ_m / τ_d) which is greater than one. Under taxes only $\partial G/\partial x_d$ must decrease to maintain equality. When x_d increases then $\partial G/\partial x_d$ decreases. Since they are normal factors of production, a increase in x_d also causes an increase in x_m. Therefore, x_m and q_m in equation 5.26, under the analysis of the *m* division, are evaluated at a higher level than under benchmark equation 4.3 with no taxes. In the tax only world, imports are higher than in the no tax world. However, with the tariffs , when $K_u = 0$ equation 5.24 becomes:

$$\partial\pi/\partial x_d = R'_d \, \partial G/\partial x_d \, [(\tau_m / \tau_d) - t] = p_d \tag{5.29}$$

As long as $t < (\tau_m / \tau_d)$, the term in brackets from equation 5.29 is positive. Compared to the tax only world in equation 5.28, imports are lower because $(\tau_m / \tau_d) - t$ is less than (τ_m / τ_d). To determine how much lower than in the tax only world, equation 5.29 is compared to the no tax world. When $\tau_m > \tau_d (1 + t)$, then the term in brackets from equation 5.29 is greater than one and $\partial G/\partial x_d$ must decrease to maintain equality, thus imports increase from the no tax world. However if $\tau_m < \tau_d (1 + t)$, then the term in brackets from equation 5.29 is less than one and $\partial G/\partial x_d$ must increase, thus imports decrease from the no tax world.

As K_u approaches 1, the term in brackets in equation 5.24 approaches one. The term in brackets from equation 5.28 also approaches one. As the gross profit percentage of the similar final product approaches one, the tariff effect and the tax effect disappears. The tariff effect becomes smaller negative and the tax effect becomes larger negative. Imports could either increase or decrease depending on which effect grows faster in absolute magnitude. Comparing terms, as before, when the gross profit percentage is zero the term in brackets from equation 5.24 is $(\tau_m / \tau_d) - t$. When the percentage approaches one the term from equation 5.24 approaches one. If $\tau_m > \tau_d(1 + t)$, then imports decrease as the gross profit percentage goes from zero to one. If the opposite were true, $\tau_m < \tau_d(1 + t)$, then imports increase. Tables VI and VII in Appendix C, summarize the conclusions of the above analysis.

Summary of First Order Conditions #1 and 2

From Tables IV to VII and the analysis in Secs. 5.3.1 and 5.3.2, the following conclusions are made. Under taxes only, when the gross profit percentage is equal to zero, the transfer price is the selling price of the final product. This is evident from equation 5.19. This high transfer price transfers income to the *m* division thus indirectly decreasing their costs of production. When production costs decrease, imports increase to i_d in Tables IV to VII. As the gross profit percentage moves from zero to one, the transfer price decreases and now indirectly causes costs to increase and imports to decrease to i_m. This movement is depicted by the top line on the graphs in Tables IV to VII.

The bottom line in each one of the graphs shows what occurs when tariffs are introduced. When the gross profit percentage is zero, imports decrease to i_t, reflecting the increased costs of production from the tariff. Imports decrease much more in tables IV and V than Tables V and VII. When $\tau_m < \tau_d(1 + t)$, the additional costs from the tariff, outweigh the additional income from the transfer price causing the greater reduction in imports between the tables.

As the gross profit percentage moves from zero to one, the transfer price decreases. As shown in Tables IV and V, when $\tau_m < \tau_d(1 + t)$, imports increase to i_m because the cost of production, from the added tariff, goes down as the transfer price goes down. However when $\tau_m > \tau_d(1 + t)$, imports decrease to i_m because indirectly costs go up as less income is transferred through the transfer price. In this case, the lower tariff does not outweigh the lower income.

All four tables also show the tariff effect disappearing as the gross profit percentage moves from zero to one. Equation 5.19 shows the calculation for the transfer price under the resale price method. When $((R_u - C_u)/R_u)$, the gross profit percentage, is equal to one, thus equation 5.19 is zero. As the gross profit percentage increases, the transfer price decreases to zero. When the transfer price is zero, the firm pays no tariff. From this analysis, the following proposition is made.

Proposition 5.3: If the resale price method is used, as the gross profit percentage of the similar final product moves from zero to one, the tariff effect disappears and imports are the same in the tax and tariff world as in the tax only world.

Sec. 5.3.3 Analysis of first order condition # 3 - Equation 5.25

To examine conditions under taxes and tariffs versus taxes only, equation 5.25 is compared to the benchmark equation with taxes only. The benchmark equation (H&S) is as follows:

$$\partial\pi/\partial q_u = \tau_d(R'_u - C'_u) - (\tau_m - \tau_d)\, R_d(q_d)((\, C_u R'_u - R_u C'_u) / (R_u)^2) = 0 \qquad (5.30)$$

The benchmark for the similar final product is the profit maximizing condition for q_u which is to set marginal revenue equal to marginal cost. Substituting R'_u for C'_u into equation 5.30 and then simplifying results in the following:

$$- (\tau_m - \tau_d)\, R_d(q_d)(\, R'_u / R_u)\, ((C_u / R_u) - 1) \qquad (5.31)$$

The same substitution is performed in equation 5.25 and results in the following:

$$(\tau_d\, t - (\tau_m - \tau_d))\, R_d(q_d)(\, R'_u / R_u)\, ((C_u / R_u) - 1) \qquad (5.32)$$

The only difference between equations 5.25 and 5.30 is the term $\tau_d\, t$ which is the tariff effect and is positive. The tax effect, $- (\tau_m - \tau_d)$, is negative. Equation 5.32 is zero when $t = (\tau_m / \tau_d) - 1$. If a government wanted to avoid any allocation distortions for the similar final product, a tariff could be set to accomplish this purpose.

To find the direction of any distortions equations 5.31 and 5.32 are compared. Equation 5.31 is positive since $(C_u/R_u) - 1$ is negative. The term, $(C_u/R_u) - 1$, is negative because at the level of q_u where $R'_u = C'_u$, $R_u > C_u$. Accordingly, at the level of q_u at which q_u's own profits are maximized, equation 5.32 is positive, which implies that overall profits are not being maximized. Equation 5.32 can be driven to zero, by causing C'_u to rise. This occurs at a point where $C'_u > R'_u$, or where more q_u is produced than is optimal in the no tax world. Therefore in the tax only world the similar final product is overproduced to reduce the gross profit percentage and increase the transfer price.

The results under taxes and tariffs, equation 5.25, depend on (τ_d t - (τ_m - τ_d)). If (τ_m - τ_d) > τ_d t, then equation 5.32 is positive but smaller than in the tax only world. The similar final product is still overproduced, to reduce the gross profit percentage, but not as much. Intuitively, this makes sense because the presence of the tariff causes the desired high transfer price under taxes only, found in equation 4.6, to be deflated by one plus the tariff, as in equation 5.14.

If (τ_m - τ_d) < τ_d t, then equation 5.32 is negative. Accordingly, at the level of q_u at which q_u's own profits are maximized, the left side of equation 5.32 is negative, which implies that overall profits are not being maximized. Equation 5.32 can be driven to zero, by causing C'_u to lower. This occurs at a point where $C'_u < R'_u$, or where less q_u is produced than is optimal in the no tax world. Therefore when (τ_m - τ_d) < τ_d t, the similar final product is underproduced to increase the gross profit percentage and decrease the transfer price.

Proposition 5.4: If $\tau_m > \tau_d$ (1 + t), the similar final product is overproduced.

It is also interesting to note that when the similar final product is overproduced under taxes and tariffs, the distortion is not as great as under taxes only. When $\tau_m > \tau_d$ (1 + t), tariffs reduce the distortion caused by taxes. As previously mentioned, this reduction occurs because under taxes and tariffs, the transfer price is not as high as under taxes only.

Proposition 5.5: If $\tau_m < \tau_d\ (1 + t)$, the similar final product is underproduced.

This conclusion is different from the one found under taxes only where the similar final product was overproduced when $\tau_m > \tau_d$.

Sec. 5.4 Cost Plus Method

As was mentioned in Sec. 4.1, the cost plus method involves adding a markup to the cost of the intermediate product. This markup is obtained by looking at the gross profit percentage of similar intermediate products manufactured and sold by the *m* division on an uncontrolled basis. Assume that the similar intermediate product, q_s, has total revenue of R_s and a total manufacturing cost, C_s. The cost plus method states that the transfer price should be:

$$r = ((p_m x_m)/q_m) + ((p_m x_m)/q_m)((R_s - C_s)/ C_s) \tag{5.33}$$

Equation 5.33 simplifies to:

$$r = ((p_m x_m)/q_m)(R_s/C_s). \tag{5.34}$$

where $(p_m x_m)/q_m$ is the cost of producing one unit of q_m.

The multinational's problem is now as follows:

$$\underset{x_m,\ x_d,\ q_s}{\text{Maximize}} \quad \tau_d\ (R_d(q_d) - p_d x_d - rq_m - rq_m t) + \tau_m\ (\ rq_m - p_m x_m + R_s - C_s)$$

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$$r = ((p_m x_m)/q_m)(R_s/C_s) \text{ and}$$

$$t \geq 0. \tag{5.35}$$

After substitution of the constraints and simplification equation 5.35 becomes:

$$\tau_d\,[R_d(\{G(q_m,x_d)\} - p_d x_d)] + p_m x_m((\tau_m - \tau_d)((R_s - C_s)/C_s) - \tau_d)$$

$$- \tau_d\, t\, p_m x_m(R_s / C_s) + \tau_m(R_s - C_s) \tag{5.36}$$

Under the cost plus method, the three first order conditions are:

$$\partial\pi/\partial x_m = R'_d\, \partial G/\partial q_m\, dF/dx_m\, [1/(L_s + 1 + M_s)] = p_m \tag{5.37}$$

$$\partial\pi/\partial x_d = R'_d\, \partial G/\partial x_d = p_d \tag{5.38}$$

$$\partial\pi/\partial q_s = \tau_m(R'_s - C'_s) + ((\tau_m - \tau_d) - \tau_d\, t)\, p_m x_m((C_s R'_s - R_s C'_s)/(C_s)^2) = 0, \tag{5.39}$$

where

$L_s = t(R_s/C_s)$ tariff effect,

$M_s = -((\tau_m / \tau_d) - 1)(R_s - C_s)/C_s$ tax regulations effect,

$R'_s = q_s$'s marginal revenue, and

$C'_s = q_s$'s marginal cost.

Sec. 5.4.1 Analysis of first order condition #1 - Equation 5.37

To find whether conditions are different under taxes and tariffs versus taxes only, equation 5.37 is compared to the benchmark equation with taxes only. The benchmark equation (H&S) is as follows:

$$\partial\pi/\partial x_m = R'_d\ \partial G/\partial q_m\ dF/dx_m\ 1/[1 + M_s] = p_m \qquad (5.40)$$

Equation 5.37 is the same as equation 5.40 except the term in the denominator, L_s, which shows the effect of the tariff and is positive. M_s is the tax effect and is negative.

Next equations 5.37 and 5.40 are explored to find the direction of any distortions. When the gross profit percentage of the similar intermediate product, $(R_s - C_s)/C_s$, is equal to zero, equation 5.40 reduces to benchmark equation 4.3 or no resource allocation distortion. With tariffs, when the gross profit percentage is zero, the term in brackets from equation 5.37 is $1/(t + 1)$. This term is less than one so the left-hand side of equation 5.37 must increase to compensate. This occurs when imports are decreased. The relationship between the tax benefits does not matter.

To obtain equality within equation 5.37, without affecting production decisions, the tariff effect must equal the tax effect. Since the tax effect is negative and the tariff effect is positive, no distortion is possible only when the gross profit percentage is negative. A negative gross profit percentage is not economically viable, so this option is not explored further.

Under taxes but no tariffs, as the gross profit percentage increases, the term in brackets in equation 5.40 becomes larger than one. To obtain equality, $\partial G/\partial q_m\ dF/dx_m$ must decrease. This decrease occurs when imports increase. Under the scenario of taxes and tariffs, the tariff effect, L_S, increases and the tax effect, M_S, increases. Compared to the tax only world, imports are lower because the tariff effect increases the denominator thus decreasing imports. To determine how much lower imports go than in the tax only world, equation 5.37 is compared to the no tax world, equation 4.3. When $L_S < M_S$ then the term in brackets in equation 5.37 is greater than one and the left-hand side must decrease to maintain equality. To accomplish this imports have to increase. If $L_S > M_S$ then the term in brackets in equation 5.37 is less than one and imports must decrease to increase the left-hand side. The conclusions presented in this section are illustrated with graphs and tables in Tables VIII and IX.

Sec. 5.4.2 Analysis of first order condition # 2 - Equation 5.38

Equation 5.38 is the same as benchmark equation 4.4, thus there are no additional distortions in this first order condition. However, because of the distortions in imports found in Sec. 5.4.1, equation 5.38 is evaluated at a different level. Because no additional distortions occur, graphs and tables are not presented for this section.

Summary of first order conditions #1 and #2

From Tables VIII and IX and the analysis in Secs. 5.4.1 and 5.4.2, the following conclusions are made. The top lines on the graphs in Tables VIII and IX show the effect, under taxes only, on imports as the gross profit percentage increase from zero to one. The imports initially are at the optimal level, i*, and then increase with the increasing gross profit percentage to i_m. An increasing gross profit percentage causes an increasing transfer price. An increasing transfer price, transfers income from *m* to *d*, thus indirectly reducing the cost of production at *m*. A decrease in the cost of production causes an increase in production and imports increase.

The introduction of tariffs causes the cost of production to increase. An increase in the cost of production causes a decrease in production and imports decrease to i_t. The bottom lines on the graphs in Tables VIII to IX show the effect on imports, under taxes and tariffs, as the gross profit percentage moves from zero to one. The graph in Table VIII shows the effect when the tax effect is larger than the tariff effect. As the transfer price increases with the increasing gross profit percentage, imports increase to i_0. The increasing transfer price represents increasing income to the *m* division and thus indirectly decreasing costs, causing imports to increase. However, because of the increased cost from the tariff, imports do not reach the same level of overproduction as under taxes only.

The graph in Table IX depicts the outcome when the tariff effect is larger than the tax effect. As the transfer price increases, the cost of production increases causing a decrease in production and thus imports to i_0. From the analysis above, the following proposition is made:

Proposition 5.6: If the cost plus method is used, then the introduction of the tariff causes imports to decrease from the level found under taxes only.

Sec. 5.4.3 Analysis of first order condition # 3 - Equation 5.39

To examine conditions under taxes and tariffs versus taxes only, equation 5.39 is compared to the benchmark equation with taxes only. The benchmark equation (H&S) is as follows:

$$\partial\pi/\partial q_s = \tau_m(R'_s - C'_s) + (\tau_m - \tau_d)\, p_m x_m((C_s R'_s - R_s C'_s)/(C_s)^2) = 0, \tag{5.41}$$

To analyze the similar intermediate product, the benchmark of $R'_s = C'_s$ is used. Under the cost plus method C'_s is substituted for R'_s into equation 5.41 and simplified resulting in the following:

$$(\tau_m - \tau_d)\, p_m x_m(C'_s / C_s)\,(1 - (R_s / C_s)) \tag{5.42}$$

The same substitution is performed in equation 5.39 and results in the following:

$$((\tau_m - \tau_d) - \tau_d\, t)\, p_m x_m(C'_s / C_s)\,(1 - (R_s / C_s)) \tag{5.43}$$

The only difference between equations 5.42 and 5.43 is the term, $- \tau_d\, t$, which is the tariff effect and is negative. The tax effect, $(\tau_m - \tau_d)$, is positive. Equation 5.43 is zero when $t = (\tau_m / \tau_d) - 1$. If a government wanted to avoid any allocation distortions for the similar intermediate product, a tariff could be set, as indicated before, to accomplish this purpose.

The find the direction of any distortions, equations 5.42 and 5.43 are compared. The first term in equation 5.42 is negative since $(1 - (R_s / C_s))$ is negative at the optimal level. All other terms are positive. Since equation 5.42 is negative, the firm increases profits by decreasing q_s. Decreasing q_s causes an increase in the gross profit percentage which, in turn, causes an increase in the transfer price. Therefore in the tax only world the similar intermediate product is underproduced to increase the transfer price.

The results under tariffs, equation 5.43, depend on $((\tau_m - \tau_d) - \tau_d t)$. If $((\tau_m - \tau_d) > \tau_d t)$, then equation 5.43 is negative but smaller than in the tax only world. The similar intermediate product is still underproduced but not as much. The term, $((\tau_m - \tau_d) > \tau_d t)$, is equivalent to $\tau_m > \tau_d (1 + t)$. Intuitively, this makes sense because the presence of the tariff causes the desired high transfer price under taxes only, found in equation 4.6, to be deflated by one plus the tariff, found in equation 5.14.

If $(\tau_m - \tau_d) < \tau_d t$, then equation 5.43 is positive. Since equation 5.43 is positive, the firm can increase profits by increasing q_s. Increasing q_s causes a decrease in the gross profit percentage which, in turn, causes a decrease in the transfer price. Therefore the multinational overproduces the similar intermediate product. The term, $((\tau_m - \tau_d) < \tau_d t)$, is equivalent to $\tau_m < \tau_d (1 + t)$.

Proposition 5.7: When $\tau_m > \tau_d (1 + t)$, the similar intermediate product is underproduced.

It is also interesting to note that when the similar intermediate product is underproduced under taxes and tariffs, the distortion is not as great as under taxes only. When $\tau_m > \tau_d (1 + t)$, tariffs reduce the distortion caused by taxes.

Proposition 5.8: When $\tau_m < \tau_d (1 + t)$, the similar intermediate product is overproduced.

This conclusion is different from the one found under taxes only where the similar intermediate product was underproduced.

Proposition 5.9: If $t = (\tau_m / \tau_d) - 1$, then all additional resource allocations distortions caused by regulations are avoided.

Proof: Resale Price Method: From equation 5.32 when $t = (\tau_m / \tau_d) - 1$, resource allocations distortions for the similar final product disappear. Substituting $t = (\tau_m / \tau_d) - 1$ into the other two first order conditions, equations 5.23 and 5.24 results into the following. Equation 5.23 becomes:

$$\partial\pi/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m \, (\tau_d / \tau_m) = p_m \tag{5.44}$$

Equation 5.24 becomes:

$$\partial\pi/\partial x_d = R'_d \, \partial G/\partial x_d = p_d \tag{5.45}$$

Cost Plus Method: From equation 5.43 when $t = (\tau_m / \tau_d) - 1$, resource allocations distortions for the similar intermediate product disappear. Substituting $t = (\tau_m / \tau_d) - 1$ into first order condition equation 5.37 results in the following[19]:

[19] The second first order condition, equation 5.38, does not contain t.

$$\partial\pi/\partial x_m = R'_d\, \partial G/\partial q_m\, dF/dx_m\, (\tau_d / \tau_m) = p_m \qquad (5.46)$$

In Sec. 5.2.1, taxes but no transfer pricing rules, equations 5.8 and 5.9 are the first order conditions when $t = (\tau_m / \tau_d) - 1$. Equations 5.44 and 5.45 are identical to 5.8 and 5.9. Equation 5.46 is identical to equation 5.8. A government could set a tariff that avoids all distortions caused by the use of regulated methods for taxes and tariffs. This conclusion is similar to a conclusion in the H&S study where distortions were avoided when $\tau_m = \tau_d$.

Sec. 5.5 Chapter Summary

This chapter introduced tariffs into the basic transfer pricing model outlined in Chapter 4. The analysis initially showed that in the absence of transfer pricing regulations, introduction of tariffs creates no resource allocation distortions. With the introduction of tariffs and taxes, imports are reduced regardless of the relationship between the taxes and tariffs. This occurs because in all scenarios the multinational pays some level of taxes and the selling price of the final product increases to compensate for the higher costs. The transfer price is only arbitrary when $\tau_m = \tau_d\,(1 + t)$. In addition, when $\tau_m > \tau_d\,(1 + t)$ the multinational chooses to set a positive transfer price and incur tariff payments even without government regulation.

The analysis next moved to the regulated transfer pricing methods. Under the resale price method as the gross profit percentage of the similar final product moves from zero to one, causing the transfer price to decrease, the effect of the tariff disappears and imports are the same as in the tax only world. Under the cost plus method, the tariff causes imports to remain at a level lower than under taxes only to keep the transfer price from increasing as much. Under both the resale price and cost plus methods of transfer pricing regulations, the similar intermediate and final products could be either over- or underproduced. Under H&S without the tariff, the similar intermediate and final products, at the respective divisions, were overproduced under the resale price method and underproduced under the cost plus method.

Finally the analysis moved to the domestic governments choice of a tariff. When the tariff is set to equal $(\tau_m / \tau_d) - 1$, all additional resource allocation distortions caused by the introduction of regulations are avoided. Under this scenario, the multinational has no incentive to move profit from one country to another similar to the situation when $\tau_m = \tau_d$. The government can obtain the best of both worlds by regulating income taxes but not causing any distortions in imports.

CHAPTER VI

LESS-THAN WHOLLY OWNED SUBSIDIARY

As was mentioned previously in Chapter 4, a wholly owned subsidiary has been assumed. Another possibility is a less than wholly owned subsidiary, which was introduced to the economics literature by Kant (1988) and discussed in the literature review. Partial ownership is an important variable to study, not only because of the results found in Kant (1988) but also because of the frequency of this form of ownership. As of 1992, 21% of the U.S. parents' ownership of nonbank foreign affiliates was less than wholly owned (U.S., 1994). The less than wholly owned affiliates accounted for 31% of total affiliate sales (U.S., 1994).

No study to date has examined the impact of a less-than wholly owned subsidiary and a regulated profits taxation transfer pricing method combined. Division *m* is the less-than wholly owned subsidiary in this chapter. The firm's problem is as follows:

Maximize $\quad Z_b = [Z_{1b}, Z_{2b}]$

x_m, x_d, r

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$r \geq 0$ and

$$L_m < 1. \tag{6.1}$$

where:

$Z_b =$ Before-tax profit vector,

$Z_{1b} = (R_d(q_d) - p_d x_d - rq_m) + L_m(rq_m - p_m x_m)$, parent's before tax profit vector,

$Z_{2b} = (1 - L_m)(rq_m - p_m x_m)$, co-owner's before tax profit vector and$L_m =$ % of *m* division owned by *d* division.

The introduction of a less-than wholly owned subsidiary causes the multinational to no longer own all of the profits. In the Kant (1988) study, the assumption was made that the multinational had complete control over the subsidiary and set the transfer price. This assumption is unrealistic. How many individuals enter into a contract with partial ownership and give up complete control over revenues?

To find the transfer price that maximizes profits the constraints are substituted into both profit functions in equation 6.1 and results in the following profit functions:

$$Z_{1b} = (R_d\{G(q_m, x_d)\} - p_d x_d - rq_m) + L_m(rq_m - p_m x_m) \tag{6.2}$$

$$Z_{2b} = (1 - L_m)(rq_m - p_m x_m) \tag{6.3}$$

The partial derivatives with respect to the transfer price are:

$$\partial Z_{1b}/\partial r = q_m (L_m - 1) \tag{6.4}$$

$$\partial Z_{2b}/\partial r = (1 - L_m)(q_m) \tag{6.5}$$

Equation 6.4 is negative since L_m is less than one by definition. Therefore, decreasing the transfer price increases profit for the multinational. On the other hand, since L_m is less than one, equation 6.5 is positive. Therefore increasing the transfer price increases the co-owner's profit. Thus, the co-owners and the *d* division face conflicting incentives.

What is a reasonable transfer price? If the transfer price is set at zero the co-owners constantly lose profit and capital, no rational individual would agree to this. If the transfer price is set at a transfer price equal to cost, the co-owners only break-even. This does not seem reasonable either. The introduction of co-owners causes the multinational to have transfer pricing problems before taxes or regulations are introduced. The multinational has a legal right to only a certain percentage of the profits as does the co-owner with their ownership percentage. A co-owner is likely to be much more diligent and interested in obtaining a mutually satisfactory price than a government agency ever could be. This may suggest that if co-ownership exists, then government regulations are no longer as important.

To explore these issues, the analysis of a less than wholly owned subsidiary in a noncooperative setting follows these steps:

Sec. 6.1: A multinational is examined in a world with a less-than wholly owned subsidiary, where a market price exists for the intermediate good. Initially the multinational faces no taxes and no mandated transfer pricing rules. Next taxes are added but no transfer pricing rules. Finally, transfer pricing rules are introduced.

Sec. 6.2: A multinational is examined with a less-than wholly owned subsidiary, where a market price for the intermediate good does not exist. Initially the multinational faces no taxes and no mandated transfer pricing rules. Next taxes are added but no transfer pricing rules. Finally, transfer pricing rules are introduced.

Sec 6.1 Less-than wholly owned subsidiary - market price exists

As mentioned above the parent and co-owners face conflicting incentives when no taxes or transfer pricing rules exist. Whether this conflict affects production and trade is explored next.

6.1.1 No taxes or transfer pricing rules

When a market price exists, the co-owners are not going to accept less than the market price and the *d* division is not going to pay more than the market price. Since the market price is an objective measure, it resolves the conflict between the multinational and the co-owner, thus it is the transfer price. As was mentioned before no rational co-owner would walk into shared ownership with no control over revenues in the subsidiary unless the multinational had no control over the revenues either.

To determine the optimal allocation for the market setting, the transfer price is set equal to the market price. The multinationals problem is now as follows.

Maximize $\quad Z_b = [Z_{1b}, Z_{2b}]$

x_m, x_d

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$$r = r_m \text{ and}$$

$$L_m < 1. \tag{6.6}$$

where:

r_m = market price for the intermediate product.

After substitution of the constraints and simplification Z_{1b} is:

$$Z_{1b} = R_d\{G(q_m, x_d)\} - p_d x_d - r_m q_m + L_m (r_m q_m - p_m x_m) \tag{6.7}$$

The first order conditions for the *d* division, equation 6.7 are:

$$\partial Z_{1b}/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m \, (1/L_m) = p_m \tag{6.8}$$

$$\partial Z1_b/\partial x_d = R'_d \, \partial G/\partial x_d = p_d \tag{6.9}$$

Equations 6.8 and 6.9 are the benchmark equations. Next the analysis is extended to include taxes but no transfer pricing rules.

6.1.2 Taxes, no Transfer Pricing Rules

The firm's problem is now as follows:

Maximize $Z_a = [Z_{1a}, Z_{2a}]$

x_m, x_d, r

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$r \geq 0$ and

$$L_m < 1. \tag{6.10}$$

where the after tax profit functions are defined as follows:

Z_a = after tax profit vector,

$Z_{1a} = \tau_d\,(R_d(q_d) - p_d x_d - r q_m) + \tau_m\, L_m(r q_m - p_m x_m),$

$Z_{2a} = \tau_m\,(1 - L_m)(r q_m - p_m x_m),$ and

τ_d and τ_m are as defined in Sec. 5.2.

The transfer price that maximizes profit is found by once again substituting the constraints into both profit functions and finding the partial derivatives with respect to the transfer price. The resulting profit functions are:

$$Z_{1a} = \tau_d\,(R_d\{G(q_m, x_d)\} - p_d x_d - r q_m) + \tau_m\, L_m(r q_m - p_m x_m) \tag{6.11}$$

$$Z_{2a} = \tau_m\,(1 - L_m)(r q_m - p_m x_m) \tag{6.12}$$

The partial derivatives are:

$$\partial Z_{1a}/\partial r = -\, q_m(\tau_d - \tau_m\, L_m) \tag{6.13}$$

$$\partial Z_{2a}/\partial r = (1 - L_m)\tau_m q_m. \tag{6.14}$$

Case 1 $\tau_d = \tau_m L_m$

Under this case equation 6.13 is zero. From the parent's perspective the transfer price is arbitrary because the multinational's profit does not change as the transfer price varies. However equation 6.14, which shows the co-owner's incentive, is positive. The co-owner wants to increase the transfer price. The optimal transfer price transfers all profits to the *m* division, but goes no higher since τ_d equals one at a higher transfer price. As seen before this optimal transfer price is $(R_d(q_d) - p_d x_d)/q_m$.[20]

To explore how *d*'s production decisions are affected, the optimal transfer price above and the constraints from equation 6.10 are substituted into Z_{1a}.

$$Z_{1a} = \tau_m L_m(R_d\{G(q_m, x_d)\} - p_d x_d - p_m x_m) \tag{6.15}$$

The first order conditions are:

$$\partial Z_{1a}/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m = p_m \tag{6.16}$$

$$\partial Z1_a/\partial x_d = R'_d \, \partial G/\partial x_d = p_d \tag{6.17}$$

Equation 6.16 is different from benchmark equation 6.8 by the term $1/L_m$, which is greater than one. In effect the derivatives in equation 6.16 are multiplied by one, thus imports decrease from the optimal level. Equation 6.17 is the same as equation 6.9, thus there are no additional distortions from the second first order condition. The introduction of taxes causes costs to increase and production to decrease. Even when using the optimal transfer price and minimizing taxes, taxes are still incurred but at a lower rate.

Case 2 $\tau_d > \tau_m L_m$

Under this scenario equation 6.13 is negative; a decrease in the transfer price increases *d* division's income. Equation 6.14 is positive. The co-owners desire a high

[20] See equation 4.6.

transfer price since that increases their income. When $\tau_d > \tau_m L_m$ the *d* division and the co-owners have conflicting incentives. For the reasons stated in Sec. 6.1.1, the transfer price is set at the market price. After substitution of the market price, r_m, and the constraints, *d*'s profit function is:

$$Z_{1a} = \tau_d \left(R_d\{G(q_m,x_d)\} - p_d x_d - r_m q_m\right) + \tau_m L_m(r_m q_m - p_m x_m) \tag{6.18}$$

The first order conditions are:

$$\partial Z_{1a}/\partial x_m = (\tau_d / \tau_m) R'_d \, \partial G/\partial q_m \, dF/dx_m \, (1/L_m) = p_m \tag{6.19}$$

$$\partial Z_{1a}/\partial x_d = R'_d \, \partial G/\partial x_d = p_d \tag{6.20}$$

The only difference between equations 6.8 and 6.19 is the term τ_d / τ_m which is less than one so $\partial G/\partial q_m \, dF/dx_m$ must increase to maintain equality. This increase occurs when imports decrease from the optimal level. As previously explained in Case 1, the introduction of taxes causes costs to increase and production to decrease.

Case 3 $\tau_d < \tau_m L_m$

In this scenario both equations 6.13 and 6.14 are positive; an increase in the transfer price increases profit. The *d* division and the co-owners have the same incentives. Both desire a higher transfer price and want all profits in the *m* division. The optimal transfer price is $(R_d(q_d) - p_d x_d)/q_m$. The optimal transfer price is identical for Cases 1 and 3. Therefore, the first order conditions and the decrease in imports are the same in both cases.

The analysis for Cases 1 - 3 brings out an interesting question. Can the multinational and the co-owners earn more profit in Case 1 or 3 than in Case 2? In Cases 1 and 3 the multinational's after-tax profit function, equation 6.15 is:

$$Z_{1a} = \tau_m L_m(R_d\{G(q_m,x_d)\} - p_d x_d - p_m x_m)$$

In Case 2 the multinational's after-tax profit function, equation 6.18 is:

$$Z_{1a} = \tau_d (R_d\{G(q_m,x_d)\} - p_d x_d - r_m q_m) + \tau_m L_m(r_m q_m - p_m x_m)$$

In Case 2, the multinational pays domestic taxes on the revenue from the final good less costs incurred at the *d* division and the transfer price. In addition, the *m* division pays taxes on the transfer price less costs at the *m* division. As shown in equation 6.15, in Cases 1 and 3 only, the *m* division pays taxes on the revenue from the final good less costs at both divisions. The *d* division pays no domestic taxes, thus earning more after-tax profits than in Case 2. The co-owners also stand to gain. Although the *m* division pays at the same tax rate in all cases, in Cases 1 and 3 the profit is higher as shown next. In Cases 1 and 3, the co-owners after-tax profit function is:

$$Z_{2a} = \tau_m (1 - L_m)(R_d\{G(q_m,x_d)\} - p_d x_d - p_m x_m) \qquad (6.21)$$

In Case 2, the co-owners after-tax profit function is:

$$Z_{2a} = \tau_m (1 - L_m)(r_m q_m - p_m x_m) \qquad (6.22)$$

As long as $R_d\{G(q_m,x_d)\} - p_dx_d > r_mq_m$, or in other words as long as the net marginal revenue from the final product is greater than the transfer price for the intermediate product, the profit is higher. The analysis above leads to the following proposition:

Proposition 6.1: If partial ownership exists, then the multinational earns more profit when $\tau_d \leq \tau_m L_m$.

6.1.3 Taxes and Transfer Pricing Rules - CUP method

With the introduction of transfer pricing regulations, when a market price exists for the intermediate good, the multinational must use the CUP method as explained in Sec. 2.1. Under the CUP method, the transfer price is the market price. The firm's problem is now as follows:

Maximize $\quad Z_a = [Z_{1a}, Z_{2a}]$

x_m, x_d

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$$r = r_m \text{ and}$$

$$L_m < 1. \tag{6.23}$$

After substitution of the constraints and simplification equation 6.23 becomes:

$$Z_{1a} = \tau_d\,(R_d\{G(q_m,x_d)\} - p_dx_d - r_mq_m) + \tau_m\,L_m(r_mq_m - p_mx_m) \tag{6.24}$$

The first order conditions are:

$$\partial Z_{1a}/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m \, (\tau_d / (\tau_m L_m)) = p_m \tag{6.25}$$

$$\partial Z_{1a}/\partial x_d = R'_d \, \partial G/\partial x_d = p_d \tag{6.26}$$

Analysis of first order conditions

To find the resource allocation distortion caused by regulations, equations 6.25 and 6.26 are compared to benchmark equations 6.16 and 6.17.[21]

Case 1 $(\tau_d = \tau_m L_m)$

In this scenario, the regulation effect disappears and equations 6.25 and 6.26 are the same as equations 6.16 and 6.17. The multinational has no incentive to distort import quantities at either division.

Case 3 $\tau_d < \tau_m L_m$

In this scenario equation 6.25 is different from benchmark equation 6.16 by the term $(\tau_d / (\tau_m L_m))$. This term is less than one and $\partial G/\partial q_m$ and dF/dx_m must increase to maintain the equality. When x_m decreases, $\partial G/\partial q_m$ and dF/dx_m increase, thus imports decrease. The introduction of regulations causes the *d* division to decrease imports. Once again equation 6.26 and 6.17 are identical but evaluated at a lower level based on the import incentives at the *d* division. Imports decrease because the regulations force the multinational to pay more taxes, thus costs increase the production decreases.

[21] Since less profit is earned in Case 2, only Cases 1 and 3 are analyzed further.

From the analysis above of Cases 1 and 3, the following conclusion is made. Under $\tau_d < \tau_m L_m$ and $\tau_d = \tau_m L_m$ without regulations the multinational and the co-owners ignore the market price. As shown above the multinational and the co-owners gain a higher profit by using the transfer price that moves all profits to the *m* division even when a market price exists. The domestic government has a powerful incentive in Cases 1 and 3 to demand the use of the market price as the transfer price. With regulations the domestic government gains tax revenue. The after-tax profit functions are the same for each tax situation, however when $\tau_d = \tau_m L_m$ the multinational has no incentive to distort import quantities. From this analysis, the following proposition is made:

Proposition 6.2: If $\tau_d \leq \tau_m L_m$, then the domestic government has an incentive to require use of the market price as the transfer price.

Sec 6.2 Less-than wholly owned subsidiary - no intermediate market price exists

The analysis now turns to the possibility of no market price for the intermediate product, whether production and trade are affected is examined next. When no market price for the intermediate product exists, the *d* division and the co-owners are assumed to negotiate a transfer price, r*.

6.2.1 No Taxes, No Transfer Pricing Rules

The firm's problem is now as follows:

Maximize $\quad Z_b = [Z_{1b}, Z_{2b}]$

x_m, x_d, r

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$$r = r^* \text{ and}$$

$$L_m < 1. \tag{6.27}$$

where:

r^* = negotiated price for the intermediate product.

After substitution of the constraints and simplification equation 6.27 becomes:

$$Z_{1b} = R_d\{G(q_m, x_d)\} - p_d x_d - r^* q_m + L_m (r^* q_m - p_m x_m) \tag{6.28}$$

The first order conditions for the *d* division are:

$$\partial Z_{1b}/\partial x_d = R'_d\, \partial G/\partial q_m\, dF/dx_m\, (1/L_m) = p_m \tag{6.29}$$

$$\partial Z_{1b}/\partial x_m = R'_d\, \partial G/\partial x_d = p_d \tag{6.30}$$

Equations 6.29 and 6.30 are the benchmark equations. Next the analysis is extended to include taxes but no transfer pricing rules.

6.2.2 Taxes, No Transfer Pricing Rules

The firm's problem is the same here as in Sec. 6.1.2. In Cases 1 and 3, the *d* division and co-owner's choose the transfer price that moves all profit to the *m* division. At the end of Sec. 6.1.2, it was shown that both the multinational and the co-owners earn a higher profit under Cases 1 and 3 than Case 2. This leads to a second question: since the multinational and the co-owners choose L_m, are they better off choosing an L_m that produces Case 1 or Case 3? The answer to this question is examined next.

Equation 6.14, the after tax profit function of the *d* division is:

$$Z_{1a} = \tau_m L_m(R_d\{G(q_m,x_d)\} - p_d x_d - p_m x_m)$$

The after tax profit function of the co-owners, equation 6.20, is:

$$Z_{2a} = \tau_m (1 - L_m)(R_d\{G(q_m,x_d)\} - p_d x_d - p_m x_m)$$

When $\tau_d = \tau_m L_m$ or rearranging , $L_m = \tau_d / \tau_m$, by substitution the two profit functions become:

$$Z_{1a} = \tau_d (R_d\{G(q_m,x_d)\} - p_d x_d - p_m x_m) \tag{6.31}$$

$$Z_{2a} = (\tau_m - \tau_d)(R_d\{G(q_m,x_d)\} - p_d x_d - p_m x_m) \tag{6.32}$$

The *d* division indirectly pays the equivalent of the domestic tax rate and the co-owners obtain the full benefit of the tax differential. When $\tau_d < \tau_m L_m$, then $L_m > \tau_d / \tau_m$. As L_m increases, the *d* division obtains part of the benefit of the tax differential. Thus the *d* division should choose $L_m > \tau_d / \tau_m$. The multinational should view $L_m = \tau_d / \tau_m$ as a threshold ownership percentage they should not go below.

Intuitively this result makes sense. When a foreign country has a lower tax rate, a multinational can increase after-tax profit when the before-tax profit is taxed at a lower rate. However, under partial ownership, the multinational does not own all of the tax benefits. At $L_m = \tau_d / \tau_m$, the multinational obtains benefits at least equal to what is available in the home country. At $L_m = \tau_d / \tau_m$ the tax benefits in the two country are effectively equalized. To obtain any of the tax differential, the ownership percentage must be increased above τ_d / τ_m. The following proposition is made from the prior analysis.

Proposition 6.3: If the multinational is obtaining an ownership interest in a foreign subsidiary, then that ownership interest should be at least equal to τ_d / τ_m but preferably greater than τ_d / τ_m.

6.2.3 Taxes and Transfer Pricing Rules - Resale Price Method

When no market price for the intermediate good exists, the firm must use a regulated method as described in Chapter 2. One method is the resale price method, where the transfer price is found by subtracting a markup from the final price. Assume that the similar final product, q_u, has total revenue of R_u and total inventoriable cost of C_u. The resale price method states that the transfer price should be:

$$r = [(R_d(q_d)/q_d) - (R_d(q_d)/q_d)((R_u - C_u)/R_u)] (q_d / q_m) \tag{6.33}$$

The term in square brackets in equation 6.33 comes directly from the regulations and q_d / q_m scales the transfer price in terms of q_m. Equation 6.33 simplifies to:

$$r = (R_d(q_d)/q_m)(C_u/R_u). \tag{6.34}$$

The multinational's problem is now as follows:

Maximize $\quad Z_a = [Z_{1a}, Z_{2a}]$

x_m, x_d, q_u

subject to:

$$q_d = G(q_m, x_d),$$

$$q_m = F(x_m),$$

$$r = (R_d(q_d)/q_m)(C_u/R_u) \text{ and}$$

$$L_m < 1. \tag{6.35}$$

where:

$Z_{1a} = \tau_d (R_u - C_u + R_d(q_d) - p_d x_d - r q_m) + \tau_m L_m(r q_m - p_m x_m)$, parent's after – tax profit function with the similar final product.

All other terms are as previously defined.

After substitution of the constraints and simplification, equation 6.35 becomes:

$$Z_{1a} = \tau_d (R_u - C_u - p_d x_d) + (\tau_d - \tau_m L_m)((R_u - C_u)/ R_u) R_d\{G(q_m,x_d)\}$$

$$+ \tau_m L_m [R_d\{G(q_m,x_d)\} - p_m x_m)] \tag{6.36}$$

The three first order conditions are:

$$\partial Z_{1a}/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m [((\tau_d/\tau_m L_m) - 1)K_u + 1] = p_m \tag{6.37}$$

$$\partial Z_{1a} /\partial x_d = R'_d \, \partial G/\partial x_d \; [(\tau_m L_m /\tau_d)(1 - K_u) + K_u] = p_d \tag{6.38}$$

$$\partial Z_{1a} /\partial q_u = \tau_d(R'_u - C'_u) - ((\tau_m L_m)- \tau_d)[R_d(q_d)((C_u R'_u - R_u C'_u)/ (R_u)^2)] = 0, \tag{6.39}$$

Where $K_u = (R_u - C_u) / R_u$, R'_u is q_u's marginal revenue, and C'_u is q_u's marginal cost.

Analysis of first order condition # 1 - Equation 6.37

To find the resource allocation distortion caused by regulations, equation 6.37 is compared to benchmark equation 6.16. The regulation effect is seen in the term $[((\tau_d/\tau_m L_m) - 1)K_u + 1]$. When the gross profit percentage is equal to zero equation 6.37 becomes:

$$\partial Z_{1a}/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m = p_m \tag{6.40}$$

When the gross profit percentage is equal to one, equation 6.37 becomes:

$$\partial Z_{1a}/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m \, [(\tau_d/(\tau_m L_m))] = p_m \tag{6.41}$$

Case 1 $\tau_d = \tau_m L_m$

In this scenario, introduction of regulations has no effect on resource allocations since equation 6.37 is the same as 6.16. This is true regardless of the gross profit percentage of the similar final product.

Case 3 $\tau_d < \tau_m L_m$

Equation 6.40 is the same as equation 6.16 and there are no resource allocation distortions when $K_u = 0$. However, when $K_u = 1$ then the term in brackets, from equation 6.41, is less than one and the derivatives on the left-hand side of the equation must increase to maintain equality. When x_m decreases, $\partial G/\partial q_m \, dF/dx_m$ increases thus imports are lower with regulations. As K_u moves from zero to one, the regulation effect causes imports to decrease.

Analysis of first order condition # 2 - Equation 6.38

To find the resource allocation distortion caused by regulations, equation 6.38 is compared to benchmark equation 6.17. The term in the brackets from equation 6.38, $[(\tau_m L_m/\tau_d)(1 - K_u) + K_u]$, shows the effect of regulations.

When the gross profit percentage is equal to zero equation 6.38 becomes:

$$\partial Z_{1a}/\partial x_d = R'_d\, \partial G/\partial x_d\, [((\tau_m L_m)/\tau_d)] = p_d \tag{6.42}$$

When the gross profit percentage is equal to one equation 6.38 becomes:

$$\partial Z_{1a}/\partial x_d = R'_d\, \partial G/\partial x_d = p_d \tag{6.43}$$

Case 1 $\tau_d = \tau_m L_m$

In this scenario, equation 6.38 is the same as equation 6.17 and the introduction of regulations has no effect on resource allocations. This is true regardless of the gross profit percentage of the similar final product.

Case 3 $(\tau_d < \tau_m L_m)$

From equation 6.42 when K_u is zero, equation 6.38 is different from equation 6.17 by the term $((\tau_m L_m)/\tau_d)$. This term is greater than one and $\partial G/\partial x_d$ must decrease to maintain equality. When x_d increases, $\partial G/\partial x_d$ decreases thus the *d* division has an incentive to increase imports. From equation 6.43, when K_u is one equation 6.38 is the same as equation 6.17. As the gross profit percentage increases the distortion caused by regulations disappears.

Summary of the first order conditions

Under the resale price method, when the gross profit percentage of the similar final product is zero imports increase to a level higher than the situations under no taxes and with taxes but without regulations. As the gross profit percentage increases imports decrease to a level below the levels found under no taxes and taxes without regulations. The similar final product is overproduced. The results of this analysis are presented in Tables X and XI.

Intuitively the mathematical findings are reasonable. From the graphs in Tables X and XI, before taxes or regulations imports are at the optimal level, i#. With the introduction of taxes, imports decrease from i# to i_p. A decrease in imports causes an increase in the selling price and thus an increase in the transfer price. As shown in Sec. 5.1.2, Cases 1 and 3, a high transfer price is desired with the introduction of taxes.

Under the resale price method, when the gross profit percentage is zero imports are overproduced at i_r. At a zero gross profit percentage, the transfer price is the selling price of the final good. This high of a transfer price indirectly causes costs of production at the subsidiary to decrease drastically. Thus imports increase to a point of overproduction. Then as the gross profit percentage increases, imports decrease to i_s or underproduction. As the gross profit percentage increases, the transfer price decreases.

Therefore, to maintain a high transfer price imports decrease thus driving up costs of production at the *m* division and the transfer price.

Analysis of first order condition # 3 - Equation 6.39

The next step is to analyze the similar final product using equation 6.39. At the optimal level, the multinational produces the similar final product where marginal revenue equals marginal cost. Substituting R'_u for C'_u into equation 6.39 simulates the optimal level of the similar final product and results in the following equation:

$$- (\tau_m L_m - \tau_d) R_d(q_d)((R'_u / R_u)((C_u/R_u) - 1) \tag{6.44}$$

When equation 6.44 equals zero, the similar final product is produced at the optimal level. When equation 6.44 does not equal zero, the production of the similar final product is distorted. Equation 6.44 is zero when $\tau_d = \tau_m L_m$ or when $(C_u/R_u) = 1$ (revenue = cost).

If $\tau_d < \tau_m L_m$, then equation 6.44 is positive since $((C_u/R_u) - 1)$ is negative. The similar final product is overproduced, to decrease the gross profit percentage, which in turn increases the transfer price for the intermediate product. Not only is the production level of the intermediate product distorted by regulations but the production level of the similar final product is also.

6.2.4 Taxes and Transfer Pricing Rules - Cost Plus Method

Under the cost plus method, a markup based on a similar intermediate product is added to the cost of production. The markup is obtained by looking at the gross profit percentage of similar intermediate products manufactured and sold by the *m* division on an uncontrolled basis. Assume that the similar intermediate product, q_s, has total revenue of R_s and a total manufacturing cost, C_s. The cost plus method states that the transfer price should be:

$$r = ((p_m x_m)/q_m) + ((p_m x_m)/q_m)((R_s - C_s)/C_s) \quad (6.45)$$

and simplifies to:

$$r = ((p_m x_m)/q_m)(R_s/C_s). \quad (6.46)$$

where $(p_m x_m)/q_m$ is the cost of producing one unit of q_m.

The multinational's problem is now as follows:

Maximize $\quad Z_a = [Z_{1a}, Z_{2a}]$

x_m, x_d, q_s

subject to:

$$\begin{aligned} q_d &= G(q_m, x_d), \\ q_m &= F(x_m), \\ r &= ((p_m x_m)/q_m)(R_s/C_s) \text{ and} \\ L_m &> 0. \end{aligned} \quad (6.47)$$

where:

$Z_{1a} = \tau_d\ (R_d(q_d) - p_d x_d - rq_m) + \tau_m\ L_m(\ rq_m - p_m x_m + R_s - C_s)$, parent's after - tax profit function with the similar intermediate product.

All other terms are as previously defined.

After substitution of the constraints and simplification equation 6.47 becomes:

$$Z_{1a} = \tau_d\ [R_d(\{G(q_m,x_d)\} - p_d x_d)] + p_m x_m((\tau_m - \tau_d)((R_s - C_s)/\ C_s) - \tau_d) + \tau_m(R_s - C_s) \qquad (6.48)$$

Under the cost plus method, the three first order conditions are:

$$\partial Z_{1a}/\partial x_m = R'_d\ \partial G/\partial q_m\ dF/dx_m\ [1/(1 - K_s(((\tau_m\ L_m)/\tau_d)-1))] = p_m \qquad (6.49)$$

$$\partial Z_{1a}\ \partial x_d = R'_d\ \partial G/\partial x_d = p_d \qquad (6.50)$$

$$\partial Z_{1a}/\partial q_s = (\tau_m\ L_m - \tau_d)p_m x_m((C_s R'_s - R_s C'_s)/C_s^2) + \tau_m L_m(R'_s - C'_s) = 0, \qquad (6.51)$$

Where $K_s = (R_s - C_s)/\ R_s$, R'_s is q_s's marginal revenue, and C'_s is q_s's marginal cost.

Analysis of first order condition # 1 - Equation 6.49

To find the resource allocation distortion caused by regulations, equation 6.49 is compared to benchmark equation 6.16. The regulation effect is seen in the term $[1/(1 - K_s(((\tau_m\ L_m)/\tau_d) - 1))]$. When the gross profit percentage is equal to zero equation 6.49 becomes:

$$\partial Z_{1a}/\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m = p_m \qquad (6.52)$$

When the gross profit percentage is equal to one, equation 6.49 becomes:

$$\partial Z_{1a} /\partial x_m = R'_d \, \partial G/\partial q_m \, dF/dx_m \, [1/(2\text{-} (\tau_m L_m)/\tau_d)] = p_m \qquad (6.53)$$

Case 1 $\tau_d = \tau_m L_m$

In this scenario, the introduction of regulations has no effect on resource allocations since equation 6.49 is the same as 6.16. This is true regardless of the gross profit percentage of the similar intermediate product.

Case 3 $\tau_d < \tau_m L_m$

Equation 6.52 is the same as equation 6.16 and there are no resource allocation distortions when K_s is zero. However when K_s is one then the term in brackets, from equation 6.53, is greater than one and the derivatives on the left-hand side of the equation must decrease to maintain equality. When x_m increases, $\partial G/\partial q_m \, dF/dx_m$ decreases thus imports are higher with regulations. As K_s moves from zero to one, the regulation effect causes imports to increase.

Analysis of first order condition # 2 - Equation 6.50

Equation 6.50 is the same as benchmark equation 6.16, thus there are no additional distortions at the *d* division. However because of the distortions in the *m* division, equation 6.50 is evaluated at a different level.

Summary of the first order conditions

When the cost plus method is used, imports initially remain at the same level as under taxes but no regulations, but as the gross profit percentage increases imports increase. However, imports do not increase as high as the optimal level under no taxes. The results of this analysis are presented in Tables XII and XIII. The similar intermediate product is underproduced.

Intuitively the mathematical findings are reasonable. From the graphs in Tables XII and XIII, before taxes or regulations imports are at the optimal level, i#. With the introduction of taxes, imports decrease from i# to i_p. A decrease in imports causes an increase in the selling price to offset the increased costs of taxes. As shown in Sec. 5.1.2, Cases 1 and 3, a high transfer price is desired with the introduction of taxes.

Under the cost plus method, when the gross profit percentage is zero imports are underproduced at i_p, the same level as under taxes only. At a zero gross profit percentage, the transfer price is the cost of producing the intermediate product. At this transfer price the costs of production at the *m* division are not disrupted. However as the gross profit percentage moves from zero to one, the transfer price increases, indirectly decreasing costs at the *m* division. This indirect reduction in costs causes imports to increase to i_s.

Analysis of first order condition # 3 - Equation 6.51

The next step is to analyze the similar intermediate product using equation 6.51. At the optimal level, the multinational produces the similar intermediate product where marginal revenue equals marginal cost. Substituting C'_s for R'_s into equation 6.51 simulates the optimal level of the similar intermediate product and results in the following equation:

$$(\tau_m L_m - \tau_d)p_m x_m((C_s'/C_s)(1 - (R_s/C_s)) \qquad (6.54)$$

When equation 6.54 equals zero, the similar intermediate product is produced at the optimal level. When equation 6.54 does not equal zero, the production of the similar intermediate product is distorted. Equation 6.54 is zero when $\tau_m L_m = \tau_d$ or when $(C_s/R_s) = 1$ (revenue = cost).

If $\tau_m L_m > \tau_d$, then equation 6.54 is negative since $(1 - (R_s/C_s))$ is negative. The similar intermediate product is underproduced, to increase the gross profit percentage, which in turn increases the transfer price for the intermediate product. Not only is the production level of the intermediate product distorted by regulations but the production level of the similar intermediate product is also.

Sec 6.3 Chapter Summary

This chapter introduced partial ownership into the basic transfer pricing model outlined in Chapter 4. The analysis initially shows, even before taxes and transfer pricing regulations are introduced, the transfer price is important because of the existence of co-owners. The combination of taxes and co-ownership allows the multinational to earn more revenue when the tax benefits in the domestic country are less than or equal to the tax benefits in the foreign country multiplied by the ownership percentage.

When a market price exists for the intermediate product and the tax benefits in the domestic country are less than or equal to the tax benefits in the foreign country multiplied by the ownership percentage, the domestic government gains tax revenue by requiring using of the market price through regulations. When the tax benefit and ownership percentage relationship is opposite to the one described above, the multinational chooses the market price as the transfer price even without regulations.

The analysis then moved to the choice of an ownership percentage. The multinational should obtain an ownership percentage at least equal to the tax benefits in the domestic country divided by the tax benefits in the foreign country. However an ownership percentage greater than the ratio of the two tax benefits, allows the multinational to obtain more of the tax benefits from a lower tax in the foreign country.

As the gross profit percentage of the similar final product increases, when the resale price method is used imports increase to a level higher than under no taxes and taxes without regulations and then to a level below the levels found under no taxes and taxes without regulations. The similar final product is overproduced. When the cost plus method is used, imports initially remain at the same level as under taxes but no regulations but then increase. However, imports do not increase as high as the optimal level under no taxes. The similar intermediate product is underproduced.

CHAPTER VII

SUMMARY AND CONCLUSION

The present study has explored from a theoretical perspective the effect of first tariffs and then partial ownership on the production and transfer pricing decisions of a multinational. The analysis involves the presentation of the model of a multinational facing taxes and transfer pricing regulations. The model was first extended to include tariffs. Second, the assumption of full ownership was relaxed to allow for partial ownership. The following summarizes the conclusions of this study.

7.1 Implications of the Tariff Extension

The initial analysis in the tariff extension showed that absent taxes and transfer pricing regulations, no resource allocation distortions result from the introduction of tariffs. The tariff itself is not the deciding criteria but rather the regulations of the price used to calculate the tariff. When taxes were introduced, imports decreased because of the increased costs involved, through the taxes and tariffs. Profits decreased even when using the optimal transfer price.

Under regulations, the multinational can decrease tariffs incurred by increasing the gross profit percentage of the similar final product under the resale price method. Tariffs cause imports to be lower when the cost plus method is used. Tariffs also caused the distortion for the similar intermediate and final products to be opposite to that found under taxes only.

Perhaps the most notable aspect of the tariff extension is the determination of a tariff which a domestic government could use to remove resource allocations while keeping regulations intact. Prior studies, for example H&S, have shown that when the tax benefits between two countries were equal no distortions occurred. The tariff gives regulators another tool to use in decreasing the distortions caused by regulations.

7.2 Implications of the Less-than Wholly Owned Subsidiary Model

Initially, the analysis showed that the presence of co-owners causes the transfer price to be important before taxes or regulations exist. The multinational still has opportunities to manipulate income through the transfer price however this opportunity does not exist in a non-cooperative setting when the tax benefit in the domestic country is higher than the tax benefit in the foreign country multiplied by the ownership percentage. When the scenario in the prior sentence exists, the multinational chooses to use the same transfer price as in the regulations. This results has important implications for tax regulators in knowing when the potential for abuse does not exist.

The most notable aspect of the partial ownership analysis in this study is the choice of an ownership percentage. Obtaining an ownership percentage, at least equal to the ratio of the tax benefits in the domestic country to the foreign country, allows the multinational to in effect equalize the tax benefits between the two countries. From that point, to obtain part of the tax differential and increase profits, the multinational should increase the ownership percentage. This has important implications for both multinationals and regulators. For the multinational, a breakeven ownership percentage is designated. For the regulators, this breakeven ownership percentage can be viewed as the point where transfer price abuses are more likely to begin.

7.3 Limitations and Extensions of the Study

The first extension of this study could be to revise the model of the multinational presented here to include both tariffs and partial ownership. Also, the implications of the analytical results of this study are limited by the use of a one period model. In a single period model, there are no tax benefits to losses. Allowing these tax benefits might extend this study. Another assumption of the model presented here is use of the same transfer price for both taxes and tariffs. The regulations for tariffs do allow some differences.

In 1986 Congress enacted Sec. 1059A in the federal income tax code. This section states that the transfer price for income tax purposes cannot be greater than the transfer price declared for customs purposes. If a taxpayer reports the same value to both customs and the IRS or a greater value to customs, then the taxpayer doesn't have to worry about problems with Sec. 1059A. This section also requires the IRS to share information with customs on the income tax values so both can find true tax liabilities when the taxpayer is under an audit. The IRS and customs face conflicting incentives concerning the transfer price. The IRS wants a low transfer price so there is more income to tax and customs wants a high transfer price to increase tariff revenue. An interesting extension of this study could be to analyze these conflicting incentives using game theory. From the perspective of the government, using agency theory, with the firm's profit function as a constraint, possibly a revenue maximizing combination of tax rate and tariff could be found.

Another extension could be to explore whether the IRS implicitly limits the use of side payments between owners by requiring a certain transfer price such as the market price to be used. Without a doubt the multinationals and the co-owners could cooperate and thus both would gain. The relationship between the multinational and co-owners could also be explored using game theory.

Based on the analytical conclusions showing the importance of tariffs and partial ownership, empirical extensions of the model could be done to explore whether decision makers understood this importance. Does the IRS realize that with partial ownership, regulations might not be as necessary in certain situations? With the high cost of auditing corporate returns, knowing when manipulations might not be as prevalent, could be useful information. Does the multinational understand the importance of other variables in the transfer pricing decision? They definitely have every incentive to understand this importance. Possibly the existence of these other variables explains the inability to reach conclusive results in studies of multinationals. For instance the GAO study cited in Sec. 1.1.2 might have been better able to tie transfer pricing abuses to zero taxes being paid.

A final possible empirical extension is testing the theory developed concerning ownership percentages in Propositions 6.1 and 6.3. Ownership percentages could be examined to see if more partial ownerships exist in situations that follow Cases 1 and 3.

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APPENDIX A

NUMERICAL ILLUSTRATION OF SOLUTIONS TO TARIFF EXTENSION

The purpose of this appendix is to illustrate examples of the solutions to the multinational's profit maximization problems presented in this paper. The basic model assumptions used in these examples are outlined in Chapters 4 and 5.

For this illustration, the elements of the profit function are described as follows:

$R_d(q_d) - p_d x_d$ or NMR = \$800

$p_m x_m$ = \$50

q_d and q_m = 100

$\tau_m = .8$

$\tau_d = .6$

t = varies

TI $_{d,\, m}$ = taxable income at the *d* and *m* division, respectively

NI $_{d,\, m}$ = net income at the *d* and *m* division, respectively

Global = global profit

A.1 High Transfer Price, Taxes Only Equation 4.6

When $\tau_m > \tau_d$ as shown in equation 4.6 a high transfer price is desired to move all profits to the *m* division. The high transfer price is the net marginal revenue divided by the quantity transferred. The following example illustrates this concept. Throughout this appendix, the row in bold represents the scenario with maximum profit.

R	NMR	Rq_m	$p_m x_m$	Ti_d	NI_d	TI_m	NI_m	Global
10	800	1000	(50)	(200)	(200)	950	760	560
9	800	900	(50)	(100)	(100)	850	680	580
8	**800**	**800**	**(50)**	**0**	**0**	**750**	**600**	**600**
7	800	700	(50)	100	60	650	520	580
6	800	600	(50)	200	120	550	440	460

A.2 Tariffs Only, Zero Transfer Price Desired Equation 5.3

When tariffs are introduced to a firm's profit function before taxes or regulations, the optimal transfer price is zero. A zero transfer price negates the tariff. The tariff for this example is assumed to be 100%.

r	NMR	$Rq_m(1 + t)$	rq_m	$p_m x_m$	NI_d	NI_m	Global
3	800	600	300	(50)	200	250	560
2	800	400	200	(50)	400	150	550
1	800	100	100	(50)	600	0	600
0	**800**	**0**	**0**	**(50)**	**800**	**(50)**	**750**

A.3 Tariffs and Taxes, Arbitrary Transfer Price Sec. 5.2.1

When $\tau_m = \tau_d(1 + t)$, the transfer price is arbitrary. This scenario holds whether regulations exist or not. The tariff for this example is assumed to be 33%. No row is in bold since the global profit is identical for all transfer prices.

r	NMR	$rq_m(1 + t)$	rq_m	$p_m x_m$	TI_d	NI_d	TI_m	NI_m	Global
4	800	533	400	(50)	267	160	350	280	440
3	800	400	300	(50)	400	240	250	200	440
2	800	267	200	(50)	533	320	150	120	440
1	800	133	100	(50)	667	400	50	40	440

A.4 Tariffs and Taxes, Zero Transfer Price - Sec. 5.2.2

When $\tau_m < \tau_d(1 + t)$, the transfer price is zero. Once again a zero transfer price negates the tariff and moves all profit to the domestic country. The tariff for this example is assumed to be 50%.

r	NMR	$rq_m(1 + t)$	rq_m	$p_m x_m$	TI_d	Ni_d	TI_m	NI_m	Global
4	800	600	400	(50)	200	120	350	280	400
3	800	450	300	(50)	350	210	250	200	410
2	800	300	200	(50)	500	300	150	120	420
1	800	150	100	(50)	650	390	50	40	430
0	**800**	**0**	**0**	**(50)**	**800**	**480**	**0**	**0**	**480**

A.5 Tariffs and Taxes, High Transfer Price Sec. 5.2.3

When $\tau_m > \tau_d(1 + t)$, the optimal transfer price is the one that transfers all profits to the *m* division. The transfer price is NMR / $q_m(1 + t)$. Substituting the data given at the beginning of Appendix A to the transfer price in the prior sentence gives an optimal transfer price of 7.27. The tariff for this example is assumed to be 10%.

r	NMR	$rq_m(1 + t)$	rq_m	$p_m x_m$	TI_d	NI_d	TI_m	NI_m	Global
9	800	990	900	(50)	(190)	(190)	850	680	490
8	800	880	800	(50)	(80)	(80)	750	600	520
7.27	**800**	**800**	**727**	**(50)**	**0**	**0**	**677**	**542**	**542**
7	800	770	700	(50)	30	18	650	520	538

APPENDIX B

NUMERICAL ILLUSTRATION OF SOLUTIONS TO LESS THAN WHOLLY-OWNED SUBSIDIARY MODEL

The purpose of this appendix is to illustrate examples of the solutions to the multinational's profit maximization problems presented in this paper. The basic model assumptions used in these examples are outlined in Chapter 6.

For this illustration, the elements of the profit function are described as follows:

$R_d(q_d) - p_d x_d =$ \$800; NMR

$p_m x_m =$ \$50

q_d and $q_m = 100$

$\tau_m = .8$

$\tau_d = .6$

$L_m =$ varies

$r_m = 2$

$TI_{d,\, m}$ = taxable income at the *d* and *m* division, respectively

$NI_{d,\, m}$ = net income at the *d* and *m* division, respectively

$L_m\ Ni_m$ = *d* division's share of *m* division income

Z_{1a} = *d* division's total profit from NI_d and $L_m\ Ni_m$

Z_{2a}= co-owner's share of *m* division income

B.1 High Transfer Price, Case 1 Sec. 6.1.2

When $\tau_d = \tau_m L_m$ the optimal transfer price transfers all profits to the *m* division and is the NMR divided by the quantity transferred in this case 100. For this example L_m is assumed to be .75. The following example illustrates this concept. As in Appendix A, the row in bold represents the profit maximizing scenario.

r	NMR	rq_m	$P_m x_m$	Ti_d	NI_d	Ti_m	NI_m	$L_m Ni_m$	Z_{1a}	Z_{2a}
8	**800**	**800**	**(50)**	**0**	**0**	**750**	**600**	**450**	**450**	**150**
7	800	700	(50)	100	60	650	520	390	450	130
6	800	600	(50)	200	120	550	440	330	450	110
5	800	500	(50)	300	180	450	360	270	450	90

B.2 High Transfer Price, Case 3 Sec. 6.1.2

When $\tau_d < \tau_m L_m$ the optimal transfer price transfer all profits to the *m* division. This optimal transfer price is the net marginal revenue divided by the quantity transferred. For this example L_m is assumed to be .80. The following example illustrates this concept.

r	NMR	rq_m	$P_m x_m$	Ti_d	NI_d	TI_m	NI_m	$L_m Ni_m$	Z_{1a}	Z_{2a}
8	**800**	**800**	**(50)**	**0**	**0**	**750**	**600**	**480**	**480**	**120**
7	800	700	(50)	100	60	650	520	416	476	104
6	800	600	(50)	200	120	550	440	352	472	88
5	800	500	(50)	300	180	450	360	288	468	72

B.3 Higher Earnings in Cases 1 and 3 than Case 2 - Proposition 6.1

To show that earnings are higher in Cases 1 and 3 than Case 2, the optimal solutions to each one are presented below. Cases 1 and 3 are repeated from B.1 and B.2 above. In Case 2, $\tau_d > \tau_m L_m$, the transfer price is the market price because of the conflicting incentives between the *d* division and the co-owners. For the Case 2 example L_m is assumed to be .6. As shown below the profits are higher for both the *d* division and the co-owner's in Cases 1 and 3.

Case 1

r	NMR	Rq_m	$p_m x_m$	Ti_d	NI_d	Ti_m	NI_m	$L_m Ni_m$	Z_{1a}	Z_{2a}
8	**800**	**800**	**(50)**	**0**	**0**	**750**	**600**	**450**	**450**	**150**

Case 2

r	NMR	Rq_m	$p_m x_m$	Ti_d	NI_d	Ti_m	Ni_m	$L_m Ni_m$	Z_{1a}	Z_{2a}
2	**800**	**200**	**(50)**	**600**	**360**	**150**	**120**	**72**	**432**	**48**

Case 3

r	NMR	Rq_m	$p_m x_m$	Ti_d	NI_d	Ti_m	Ni_m	$L_m Ni_m$	Z_{1a}	Z_{2a}
2	**800**	**200**	**(50)**	**0**	**0**	**750**	**600**	**480**	**480**	**120**

B.4 Case 3 Preferable to Case 1 Proposition 6.3

The first step in this example is to show the profit in each division if the market price was the transfer price. This is seen in Case 2 above where NI_d = \$360 and NI_m = \$120 for a total profit of \$480. At a high transfer price of \$8, that takes advantage of the lower tax benefits in the foreign country, total profit is found by adding $\pi_1 + \pi_2$ in Case 1 or Case 3. The total profit if \$600. The tax benefit is the difference between the total profit amounts or \$120. Equations 6.31 and 6.32 show the profit split between the *d* division and the co-owner's. After substituting the numerical values used in Case 1, equation 6.31 and 6.32 become:

Z_{2a} = .6 (\$800 - 50) = \$450

Z_{1a} = (.8-.6) (\$800 - 50) = \$150

In Case 1 using the market price as the transfer price, the profit split is:

r	NMR	rq_m	$p_m x_m$	Ti_d	NI_d	Ti_m	Ni_m	$L_m Ni_m$	Z_{1a}	Z_{2a}
2	**800**	**200**	**(50)**	**600**	**360**	**150**	**120**	**90**	**450**	**30**

When the multinational takes advantage of the tax differential and uses the high transfer price of \$8, the profit split is the same as Case 1 above, presented again for ease of comparison.

r	NMR	rq_m	$p_m x_m$	Ti_d	NI_d	Ti_m	Ni_m	$L_m Ni_m$	Z_{1a}	Z_{2a}
2	**800**	**800**	**(50)**	**0**	**0**	**750**	**600**	**450**	**450**	**150**

The tax differential of $120 goes to the co-owner's. However when the ownership percentage is chosen under the requirements of Case 3, the *d* division now obtains more of the tax differential and the co-owner's less. Case 3 is also presented again for ease of comparison.

r	NMR	rq_m	$p_m x_m$	Ti_d	NI_d	Ti_m	Ni_m	$L_m Ni_m$	Z_{1a}	Z_{2a}
2	**800**	**800**	**(50)**	**0**	**0**	**750**	**600**	**480**	**480**	**120**

APPENDIX C

TABLE I

Transfer Pricing Court Case Decisions

Multinational	Year's In Issue	Year Settled	IRS Assessed Deficiency (millions)	% Allowed by Court
Altama Delta	1985 - 87	1995	$ 1.5	50
Seagate Technology	1981 - 87	1994	$ 110.0	15
National Semiconductor	1978 - 82	1994	$ 122.2	33
Perkin-Elmer	1975 - 81	1993	$ 26.1	21
Exxon	1980 - 82	1993	$ 6,800.0	0
Proctor & Gamble	1978 - 79	1992	$ 1.9	0
Westreco	1978 - 82	1992	$ 8.8	0
Sunstrand	1977 - 78	1991	$ 15.2	12.5
Merck & Co	1975 - 76	1991	$ 4.9	0
Bausch & Lomb	1979 - 82	1989	$ 29.8	17
Eli Lilly	1971 - 73	1988	$ 71.0	32
G. D. Searle	1974 - 75	1987	$ 57.8	31
Total			$7,249.2	*

*Average percentage of proposed adjustment allowed - 1.5%
(If Exxon excluded - 24.6%)
Sources on next page

Sources:
Altama Delta Corp. v. Commissioner, 104 T.C. 22
Seagate Technology, Inc. v. Commissioner, 102 T.C. 149
National Semiconductor Corp. v. Commissioner, 67 T.C.M. (CCH) 2849
Perkin-Elmer Corp. v. Commissioner, 66 T.C.M. (CCH) 634
Exxon Corp. v. Commissioner, 66 T.C.M. (CCH) 1707
Proctor & Gamble v. Commissioner, 95 T.C. 323 (1990), aff'd, 961 F.2d 1255
Westreco, Inc. v. Commissioner, 64 T.C.M. (CCH) 849
Sunstrand Corp. v. Commissioner, 96 T.C. 226
Merck & Co., Inc., v. United States, 24 Cl.Ct 73, 91-2 USTC 50,456
Bausch & Lomb, Inc., v. Commissioner, 933 F.2d 1084
Eli Lilly & Co., v. Commissioner, 84 T.C. 996 (1985), aff'd in part, rev'd in part and remanded, 856 F.2d 855
G.D. Searle & Co. v. Commissioner, 88 T.C. 25

TABLE II

A Breakdown of Transfer Pricing Methods by Respondent Firms*

Pricing Method	Domestic Transfer Prices	International Transfer Prices
Cost-based		
transfer prices		
Full Cost Plus markup	16.6%	26.8%
Other	29.6	14.6
Total Cost-based	46.2%	41.4%
Market-based		
transfer prices		
Market Price	25.1	26.1
Market Price less margin	7.6	12.1
Other	4.0	7.7
Total Market-based	36.7%	45.9%
Other (includes negotiated price)	17.1	12.7
Total - all methods	100.0%	100.0%

Source: Tang, 1993
*Survey done in 1990 included 143 firms

TABLE III

Numerical Examples of Transfer Pricing Methodologies

Resale Price of Final Product = $75
Affiliate's Cost of Production = $20

Comparable Uncontrolled Price Method

Affiliate's Sales Price to Unrelated Buyers:
Buyer # 1 = $46
Buyer # 2 = $50
Buyer # 3 = $55
Arm's Length Range = $46 to $55; Median = $50

Transfer Price to Parent = $50

Assumption: Sales to unrelated parties are comparable.

Resale Price Method

Parent's Gross Profit on Sales of Unrelated Manufacturer's Products:
Product # 1 = 30%
Product # 2 = 33.3%
Product # 3 = 35%
Arm's length range = 30% to 35%; Median = 33.3%

Transfer Price to Parent = Resale Price less gross profit
$75 - (33.3% * 75) = $50

Assumption: Sales used in calculation of gross profit defined as comparable.

Cost Plus Method

An analysis of sales between affiliate and other buyers of unrelated products and between sales of unrelated manufacturers and buyers in the same industry segment yields a standard markup of 150%.

Transfer Price to Parent = Affiliate's cost of production + Standard Markup
$20 + (150% * 20) = $50

Assumption: Sales used in calculation of standard markup defined as comparable.

Source: Sherman & McBride, 1995

TABLE IV

Conclusions of Resale Price Method Analysis of First Order Condition # 1

Sec. 5.3.1

When $\tau_m < \tau_d (1 + t)$	$K_u = 0$	$K_u = 1$
no taxes	no distortion imports at i*	no distortion imports at i*
taxes only	imports increase from i* to i_d	imports decrease from i_d to i_m
taxes and tariffs	imports decrease from i_d to i_t	imports increase from i_t to i_m

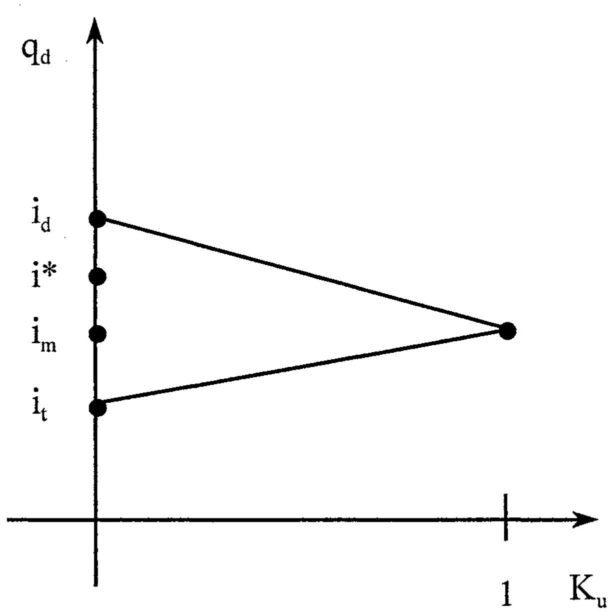

TABLE V

Conclusions of Resale Price Method Analysis of First Order Condition # 1

Sec. 5.3.1 cont.

When $\tau_m > \tau_d (1 + t)$	$K_u = 0$	$K_u = 1$
no taxes	no distortion imports at i*	no distortion imports at i*
taxes only	imports increase from i* to i_d	imports decrease from i_d to i_m
taxes and tariffs	imports decrease from i_d to i_t	imports decrease from i_t to i_m

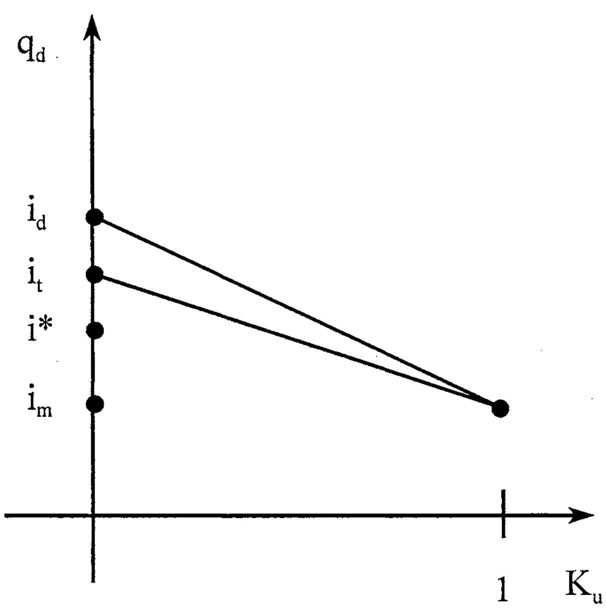

TABLE VI

Conclusions of Resale Price Method Analysis of First Order Condition # 2

Sec. 5.3.2

When $\tau_m < \tau_d (1 + t)$	$K_u = 0$	$K_u = 1$
no taxes	no distortion imports at i*	no distortion imports at i*
taxes only	imports increase from i* to i_d	imports decrease from i_d to i_m
taxes and tariffs	imports decrease from i_d to i_t	imports increase from i_t to i_m

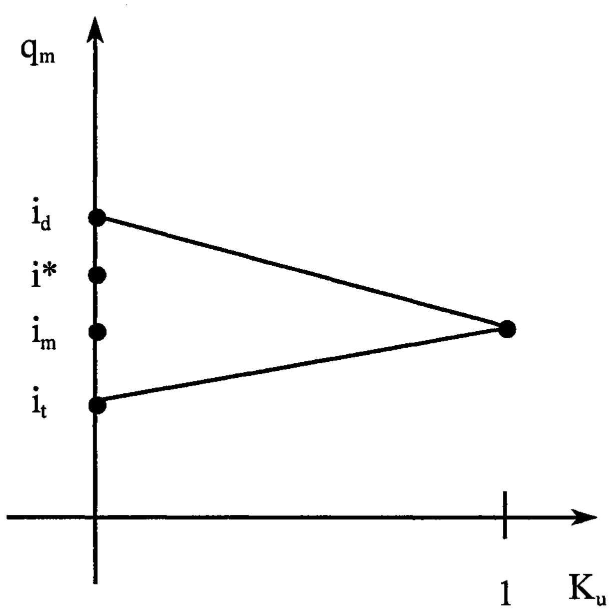

TABLE VII

Conclusions of Resale Price Method Analysis of First Order Condition # 2

Sec. 5.3.2 cont.

When $\tau_m > \tau_d (1 + t)$	$K_u = 0$	$K_u = 1$
no taxes	no distortion imports at i*	no distortion imports at i*
taxes only	imports increase from i* to i_d	imports decrease from i_d to i_m
taxes and tariffs	imports decrease from i_d to i_t	imports decrease from i_t to i_m

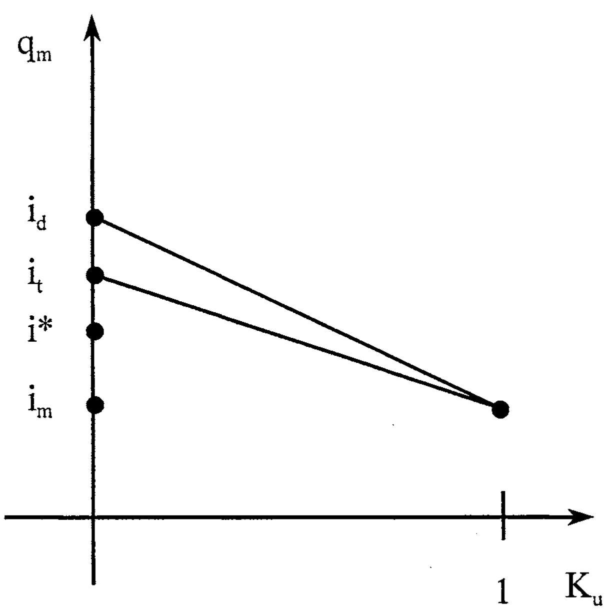

TABLE VIII

Conclusions of Cost Plus Method Analysis of First Order Condition # 1

Sec. 5.4.1

When $L_S < M_S$	$K_S = 0$	$K_S = 1$
no taxes	no distortion imports at $i*$	no distortion imports at $i*$
taxes only	no distortion imports at $i*$	imports increase from $i*$ to i_m
taxes and tariffs	imports decrease from $i*$ to i_t	imports increase from i_t to i_o

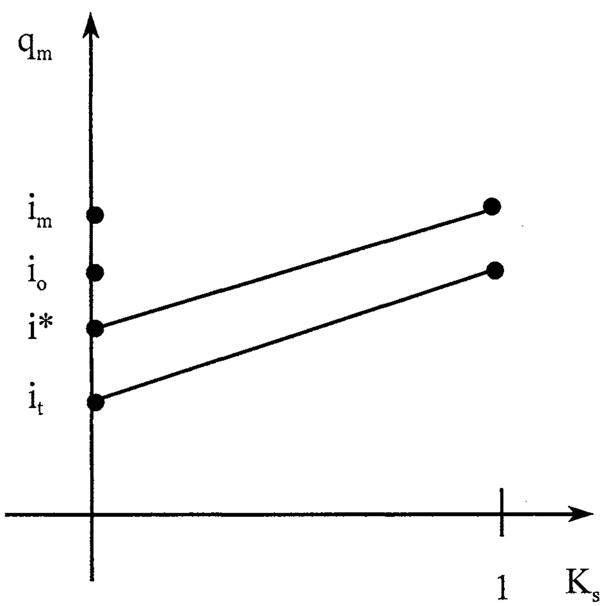

TABLE IX

Conclusions of Cost Plus Method Analysis of First Order Condition # 1

Sec. 5.4.1 cont.

When $L_S > M_S$	$K_S = 0$	$K_S = 1$
no taxes	no distortion imports at i∗	no distortion imports at i∗
taxes only	no distortion imports at i∗	imports increase from i* to i_m
taxes and tariffs	imports decrease from i* to i_t	imports decrease from i_t to i_o

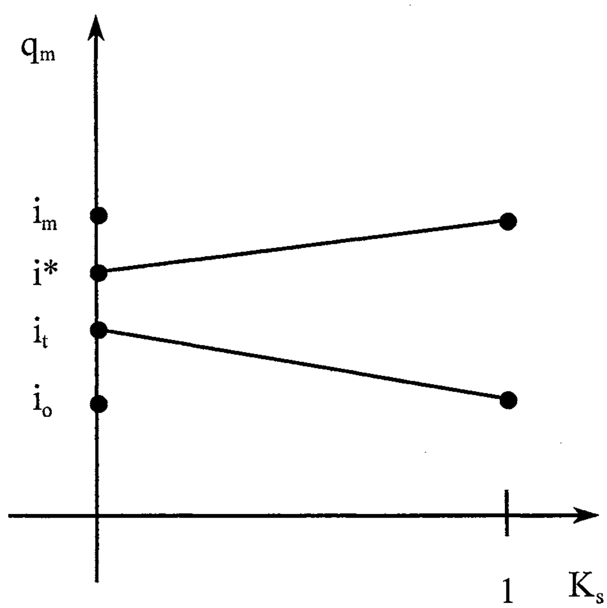

TABLE X

Conclusions of Resale Price Method Analysis of First Order Condition # 1

Sec. 6.2.3

When $\tau_d < \tau_m L_m$	$K_u = 0$	$K_u = 1$
no taxes	no distortion imports at i#	no distortion imports at i#
taxes, no regulations	imports decrease from i# to i_p	imports decrease from i# to i_p
taxes & regulations	imports increase from i_p to i_r	imports decrease from i_r to i_s

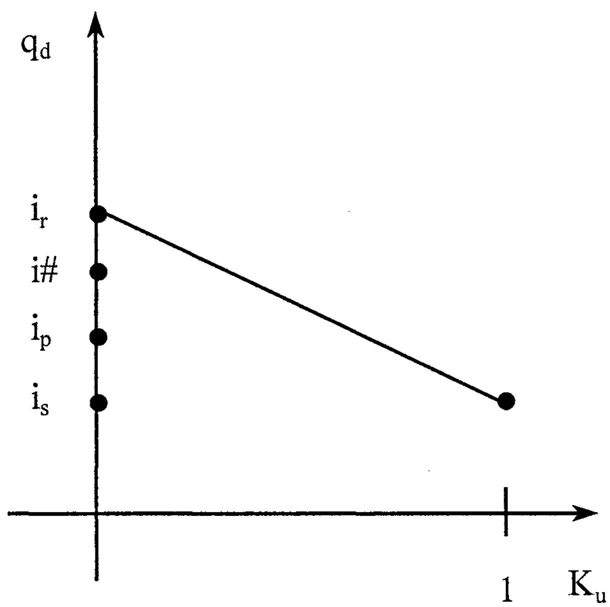

TABLE XI

Conclusions of Resale Price Method Analysis of First Order Condition # 2

Sec. 6.2.3

When $\tau_d < \tau_m L_m$	$K_u = 0$	$K_u = 1$
no taxes	no distortion imports at i#	no distortion imports at i#
taxes, no regulations	imports decrease from i# to i_p	imports decrease from i# to i_p
taxes & regulations	imports increase from i_p to i_r	imports decrease from i_r to i_s

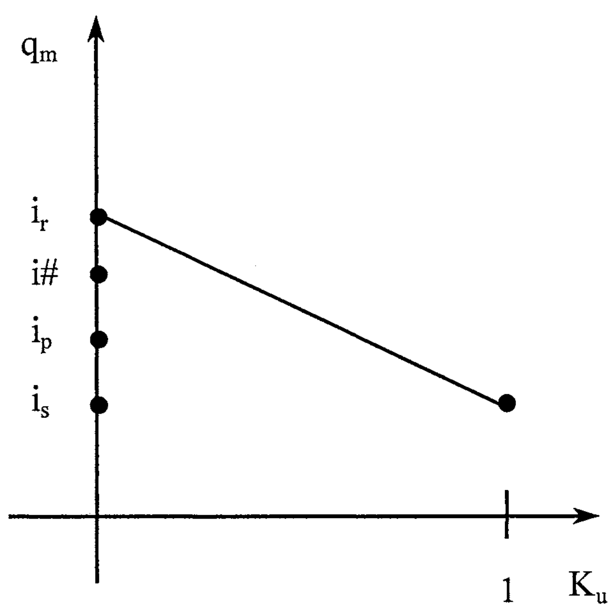

TABLE XII

Conclusions of Cost Plus Method Analysis of First Order Condition # 1

Sec. 6.2.4

When $\tau_d < \tau_m L_m$	$K_S = 0$	$K_S = 1$
no taxes	no distortion imports at i#	no distortion imports at i#
taxes, no regulations	imports decrease from i# to i_p	imports decrease from i# to i_p
taxes & regulations	imports remain at i_p	imports increase from i_p to i_S

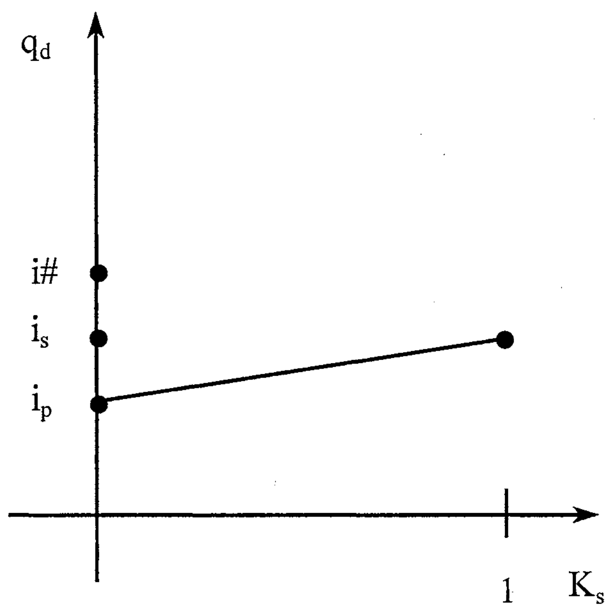

TABLE XIII

Conclusions of Cost Plus Method Analysis of First Order Condition # 2

Sec. 6.2.4

When $\tau_d < \tau_m L_m$	$K_S = 0$	$K_S = 1$
no taxes	no distortion imports at i#	no distortion imports at i#
taxes, no regulations	imports decrease from i# to i_p	imports decrease from i# to i_p
taxes & regulations	imports remain at i_p	imports increase from i_p to i_s

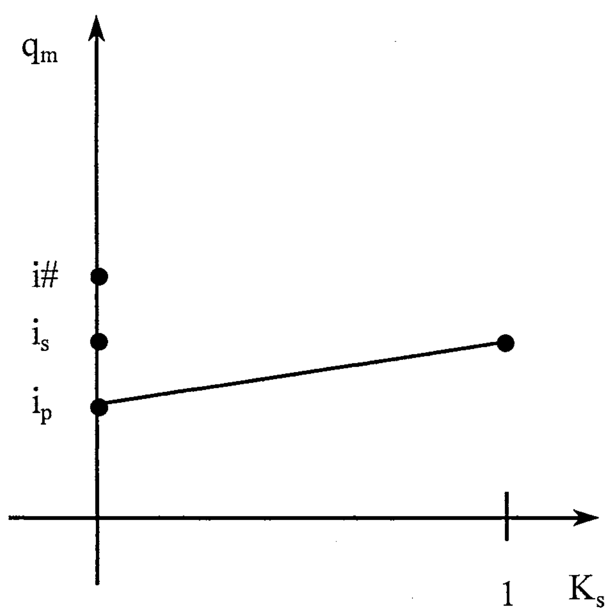

TABLE XIV

SUMMARY OF NOTATION

m	= manufacturer subsidiary in foreign country
x_m	= factor of production at *m* division
p_m	= unit cost of x_m
$F(\cdot)$	= *m*'s production function
q_m	= intermediate product
d	= distribution subsidiary in domestic country
r	= transfer price *m* charges *d*
r*	= negotiated transfer price
r_m	= market price for the intermediate product
q_d	= final product
x_d	= factor of production at *d* division
p_d	= unit cost of x_d
$G(\cdot,\cdot)$	= *d*'s production function
$R_d\ (q_d)$	= revenue function at *d* division
π	= profit function
$\tau_{d,m}$	= tax benefit at *d* and *m* divisions, respectively
t	= % tariff levied on transfers to *d* division
q_u	= similar final product at *d* division
R_u	= total revenue from q_u
C_u	= total inventoriable cost of q_u
K_u	= q_u's gross profit percentage
q_s	= similar intermediate product at *m* division
R_s	= total revenue from q_s

C_s	= total inventoriable cost of q_s
K_s	= q_s's gross profit percentage
L_s	= tariff effect in the Cost Plus Method
M_s	= tax effect in the Cost Plus Method
L_m	= % of *m* division owned by *d* division
Z_b	= global before tax profit
Z_{1b}	= parent's before tax profit function
Z_{2b}	= coowner's before tax profit function
Z_a	= global after tax profit
Z_{1a}	= parent's after tax profit function
Z_{2a}	= co-owner's after tax profit function
$i*$	= optimal level of imports under tariffs
i_d	= imports under taxes only, $K_u = 0$
i_m	= imports under taxes only and taxes & tariffs, K_u, $K_s = 1$
i_t	= imports under taxes & tariffs, K_u, $K_s = 0$
i_o	= imports under taxes and tariffs, $K_s = 1$
$i\#$	= optimal level of imports, partial ownership
i_p	= imports under taxes no regulations, partial ownership
i_r	= imports under taxes and regulations, partial ownership, K_u, $K_s = 0$
i_s	= imports under taxes and regulations, partial ownership, K_u, $K_s = 1$

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VITA

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Candidate for the Degree of

Doctor of Philosophy

Thesis: THE EFFECTS OF TARIFFS, PARTIAL OWNERSHIP, AND REGULATED TRANSFER PRICING ON PRODUCITON DECISIONS

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