Optimal Negotiated Transfer Pricing: MNCs’ Tangible and Intangible Intra-Firm Transfers

Peter C. Dawson
University of Connecticut
Storrs, Connecticut, USA
petercdawson@yahoo.com

and

Stephen M. Miller*
College of Business
University of Nevada, Las Vegas
4505 Maryland Parkway
Las Vegas, Nevada, USA 89154-6005
stephen.miller@unlv.edu

Abstract:

International intra-firm trade is extensive. Negotiated transfer pricing is common, but the literature argues that it is not optimal. Domestic divisionalized firms achieve optimality assuming transfer price for both tax and performance evaluation. For MNCs, agency costs related to fairness prevent optimality. Our bargaining structure, with performance evaluation disconnected from transfer price, produces optimality. Little transfer pricing research examines licensed intangibles, though it accounts for much international intra-firm trade. The literature assumes positive marginal costs, yet the nature of intangibles indicates a zero marginal cost. Assuming zero marginal cost, we conclude that intangibles offer the greatest potential for transfer pricing abuse.

Key Words: Negotiated transfer pricing, bargaining, licensing intangibles, decentralized multinational corporations, international trade, intrafirm trade.

JEL Codes: F10, F23; H26; L24; O34.
1. Introduction

Thirty to 60 percent of international trade occurs through intra-firm trade between related or controlled divisions of multinational corporations (MNCs) (Guttman 1999; Stanley 2001; Diewert, Alterman, and Eden 2005) at prices, called “transfer prices”, that are determined within MNCs rather than at arm’s length in an external market. The extent of internal MNC trade creates a substantial opportunity for MNCs to adjust transfer prices to shift profit earned in high-tax countries to related corporate entities or divisions in low-tax or tax-haven countries. This opportunity, coupled with an MNC’s fiduciary imperative to maximize world-wide after-tax profit, raises governmental concerns about abusive transfer pricing practices. In an unpublished federally-funded study of U.S. Customs data, Pak and Zdanowicz (2002) report dramatic over-invoicing of U.S. imports and under-invoicing of U.S. exports, creating an estimated aggregate $53.1 billion loss in U.S. federal tax revenue in 2001 (Diewert, Alterman, and Eden 2005, p. 4; Dorgman 2002). Eden (2003) concludes “empirical evidence for transfer pricing manipulation exists but is not overwhelming” (p. 7), while Diewert, Alterman, and Eden (2004) argue that, in general, the empirical literature on the extent of transfer pricing manipulation proves “mixed” (p. 3).

This paper examines the strength of incentives for transfer pricing abuse, for tangible versus intangible intra-firm trade, from an economic perspective. Under negotiated transfer pricing, a major concern considers the ability of the MNC to create goal congruence without sacrificing division autonomy (Hansen and Kimbrell 1991; Chalos and Haka 1990). With our alternative bargaining structure, which evaluates division management performance independently of the negotiated transfer price, autonomous divisions face sufficient incentives to select the firm-wide optimal transfer price (on the arm’s length boundary) and tangible intra-firm
trade. That is, for tangible intra-firm trade, MNCs avoid taxes, but, given identifiable (near) comparable uncontrolled prices, do not necessarily face powerful incentives to evade taxes. For licensed intangible transfers under negotiated transfer pricing, however, the nature of intangibles creates a larger optimal profit shift for a given tax rate differential, which strengthens incentives for transfer pricing abuse. Coupled with the absence of (near) comparable uncontrolled transactions, an intangible’s arm’s length range, therefore, only provides a guideline, a context where incentives for abuse materialize.

2. The Core Model

The MNC owns two divisions, one operating in the domestic country (country 1) and the other operating in a foreign country (country 2) (Hirshleifer 1956, 1964; Horst 1971; Bond 1980). Division 2’s operations constitute a wholly-owned and controlled subsidiary of the parent company, incorporated under the laws of country 2. By convention, intra-firm trade flows from division 1 to division 2, reflecting an MNC’s vertical or horizontal integration strategy. Top management maximizes the MNC’s global after-tax profit, subject to regulatory constraints. The MNC’s domestic currency-denominated global after-tax profit is

$$\Pi_{MNC}^{dc} = (1 - t_1) \Pi_i^{dc} + \left( \frac{1}{E} \right) (1 - t_2) \Pi_2^{fc}, \quad (1)$$

where $$\Pi_i^{dc}$$ is the domestic currency value of division 1’s before-tax profit, $$\Pi_2^{fc}$$ is the foreign currency value of division 2’s before-tax profit, $$t_1$$ and $$t_2$$ are country 1’s and 2’s effective corporate income tax rates, $$E$$ is the nominal exchange rate defined as foreign currency per domestic currency (which does not equal 1), and there is no import tariff (Bond 1980). Furthermore,

$$\Pi_i^{dc} = P_i^{dc} X_{i1} + P_{i2}^{dc} X_{i2} - C_i^{dc}(X_i), \quad (2)$$
\[ \Pi_2^{fc} = P_2^{fc} Y_2 - \gamma_2^{fc} (Y_2) - P_{12}^{fc} X_{12}, \]  

where division 1 produces good 1, \( X_1 \), that sells in country 1, \( X_{11} \), and also sells intra-firm to division 2 in country 2, \( X_{12} \), at a per-unit domestic currency transfer price of \( P_{12}^{dc} \), and \( X_{1} = X_{11} + X_{12} \). Division 1 incurs a domestic currency cost of producing good 1, \( C_1^{dc} \). Division 2 uses \( X_{12} \) as an input in the production of good 2, \( Y_2 \), for sale in country 2. Division 2 incurs a foreign currency production cost, \( \gamma_2^{fc} \). Division 2 uses \( X_{12} \) as a variable resource input in its production of good 2, in addition to the variable labor/input costs already included in \( \gamma_2^{fc} \). 

\( P_{12}^{fc} X_{12} \) equals the foreign-currency value of division 2’s intra-firm input cost. Division 2’s before-tax profit, \( \Pi_2^{fc} \), enters top management’s profit-maximizing objective function as \( \Pi_2^{dc} \) 

\[ \Pi_2^{dc} = \frac{\Pi_2^{fc}}{E}. \]

By convention, division 2 uses one unit of \( X_{12} \) to produce one unit of \( Y_2 \) (i.e., \( Y_2 = f(X_{12}) = X_{12} \)). Relaxing this assumption does not alter the quality of the results (Bond 1980, p. 196). No outside market for the intermediate good exists (i.e., \( X_{11} = 0 \) and \( X_{1} = X_{12} \)). Division 2 faces a perfectly competitive output market (i.e., \( P_2^{fc} = P_2^{dc} \)), a strategic simplifying assumption that does not change the qualitative results (Bond 1980, pp. 193-194). Therefore, the core synthesis model (in domestic currency) is

\[ \Pi_{MNC} = (1-t_1) \Pi_1 + (1-t_2) \Pi_2, \]  

\[ \Pi_1 = P_{12} X_{12} - C_1(X_{12}), \]  

(1’)

and

(2’)

\[ \gamma_2^{fc} \] equals division 2’s cost of processing good 1 for resale as good 2.
The intra-firm quantity traded depends on the transfer price (i.e., \( X_{12} = X_{12}(P_{12}) \)) which allows division managements, under decentralized decision making (DDM), to choose their respective quantities supplied and demanded (i.e., \( \frac{dP_{12}}{dX_{12}^s} = C^s > 0 \), and \( \frac{dP_{12}}{dX_{12}^d} = -\gamma^d < 0 \)). The internal market supply and demand curves are illustrated in Figure 1.3

Under centralized decision making (CDM), \( X_{12} = \overline{X}_{12} = X_{12}^0 \), since top management determines the quantity of intra-firm trade.

The no outside market for the intra-firm good assumption is relevant to the typical MNC. For example, Spicer (1988) argues that for idiosyncratic intermediate goods or for significant transaction-specific human and/or physical capital, internal trade may best promote the interests of the firm. From a broader perspective, a vertical integration strategy requires that the MNC does not use the external market, if any, to source certain inputs (Eccles 1985, p. 79). A vertical integration strategy reflects anticipated synergistic benefits of integration, including cost savings or productivity enhancements from sourcing with a related or controlled division of the MNC. Furthermore, MNCs that do not face an external market, and therefore do not face an easily discernible comparable uncontrolled market price, maintain more flexibility to adjust their transfer price.

\[ \Pi_I = \frac{\Pi_I^D}{\Pi_I} = P_{12} X_{12} - \gamma X_{12} - P_{12} X_{12}. \] (3')

---

2 See Appendix A for these derivations.

3 Figure 1 reflects Hirshleifer’s (1956, 1964) model, except his analysis assumes \( C^s > 0 \) and \( \gamma^d > 0 \). To simplify, we assume linear marginal costs. The superscript “0” refers to internal equilibrium.

In Horst (1971), the MNC faces an import tariff or duty, \( d_2 \), in country 2 on the value of intra-firm trade, and is horizontally integrated (i.e., division 2 resells \( X_{12} \) as its final good 2, which is now \( X_2 \) instead of \( Y_2 \)). Division 2 produces part of \( X_2 \) itself (i.e., \( X_{22} \)) with a production cost, \( C_{22} \), does not incur a processing cost for the portion of good 2 that it imports from division 1 (\( \gamma_2 = 0 \)), and sells good 2 in an imperfectly competitive output market. Therefore,

\[
\Pi_2 = P_2X_2 - C_{22}(X_{22}) - (1 + d_2)P_{12}X_{12},
\]

(4)

where \( P_2 = P_2(X_2) \) and \( X_2 = X_{22} + X_{12} \). An imperfectly competitive external market for the intra-firm good exists, where division 1 sells the intra-firm good to unrelated parties in country 1 as good 1, \( X_{11} \), and \( P_1 = P_1(X_{11}) \). Therefore,

\[
\Pi_1 = P_1X_{11} + P_{12}X_{12} - C_1(X_1).
\]

(5)

Equations (1'), (4), and (5) represent Horst’s (1971) original model, which assumes CDM since the quantity of intra-firm trade, \( X_{12} \), does not depend on the transfer price, \( P_{12} \). Several possible scenarios may underlie the CDM assumption, including: (i) The MNC operates as a traditional neoclassical firm, or “black box,” with no explicit decision-makers or agency relationships, and the “firm” chooses the transfer price and the quantity of intra-firm trade to maximize \( \Pi_{MNC} \); (ii) an owner-operated MNC faces no principal-agent problems, since the owner makes all operating divisions, and the owner chooses both the transfer price and quantity of intra-firm trade to maximize \( \Pi_{MNC} \); or (iii) the MNC’s top management implements a perfect management control system that corrects all principal-agent problems, such that division managements choose the transfer price and the quantity of intra-firm trade that maximize \( \Pi_{MNC} \). Given the benefits of
decentralization, the typical MNC delegates decision-making authority/responsibility to division managements in different countries, such that an agency relationship between top management and division managements exists. For comparison purposes, scenario (iii) best characterizes CDM.

Substitute equations (4) and (5) into equation (1') to produce

$$\Pi_{MNC} = Z + P_{12}X_{12}[(t_2-t_1)-(1-t_2)d_2],$$

where $Z = (1-t_1)[P_1X_{11}-C_1] + (1-t_2)[P_2X_{22}-C_{22}]$. The first-order condition for an optimum yields

$$\frac{d\Pi_{MNC}}{dP_{12}} = X_{12}[(t_2-t_1)-(1-t_2)d_2] > 0.$$  (7)

Horst (1971) concludes that when $(t_2-t_1)$ exceeds (falls below) $(1-t_2)d_2$, $\frac{d\Pi_{MNC}}{dP_{12}} > 0 (< 0)$ and the firm raises (lowers) the transfer price to the highest (lowest) allowable level. When the home (foreign) country imposes a high-enough tax rate (import tariff rate), the firm can “take a beating” on the import duty (home country corporate tax bill) to avoid a relatively high tax bill in country 1 (high import tariff in country 2).

The MNC abides by transfer pricing regulations. According to Eden (1985), Horst (1971) assumes that the arm’s length price lies in the $P_i$ to $C_i$ range, since “he expected tax and tariff authorities to impose $MC_i$ as an effective lower bound and $P_i$ as an upper bound to $P_{12}$” (p. 19). Booth and Jensen (1977) note that the transfer price is arbitrary and indeterminate when top management’s profit-maximizing objective is unconstrained, such as by an arm’s length constraint (p. 434). Schjelderup and Sørgard (1995) impose an internal profit constraint to ensure
a determinate solution. Since an MNC cannot deduct losses earned in one country on its tax return in another country, the MNC does not adjust the transfer price such that it earns a loss in its high-tax division. Rather, the transfer price adjusts only until the high-tax division earns zero profit. Booth and Jensen (1977) show that the transfer price becomes determinate when top management, in general, constrains itself to meet minimum profit levels in each country.

Under the assumptions of our simplified core model, we obtain a modified Horst (1971) CDM solution, which is

\[
\frac{d\Pi_{MNC}}{dP_{12}} = X_{12} \left[ (t_2 - t_1) \right] \geq 0. \tag{8}
\]

When \( t_2 > t_1 \) (\( t_2 < t_1 \)), the MNC chooses the highest (lowest) allowable transfer price to maximize \( \Pi_{MNC} \), given its optimal choice of \( X_{12}^0 \), where the arm’s length range implicitly constrains the transfer price.\(^5\)

4. Decentralized Decision Making: Centralized Transfer Pricing

In Bond’s (1980) decentralized MNC, top management chooses the transfer price (i.e., centralized transfer pricing) and division managements choose the quantity of intra-firm trade and division output. Bond’s model contains equations (1’), (2’), and (3’) of the core model. Given the centralized transfer price set by top management, each division responds by choosing its optimal quantity of the intra-firm good. The divisions maximize as follows:

**Division 1:**

\[
\text{Max}_{X_{12}} (1-t_i) \Pi_{1} \bigg|_{P_{12}} \quad \Rightarrow \quad (1-t_i) \left[ P_{12} - C_1^i \right] = 0; \quad \text{and} \tag{9}
\]

---

\(^4\) Under the U.S. transfer pricing regulations in §1.482, a firm must report “arm’s length” income, which conforms to the “arm’s length standard” (§1.482-1(b)(1)).

\(^5\) The assumption of an arm’s length range proves appropriate, given existing tax policy. For example, under the U.S. transfer pricing regulations, the arm’s length transfer price must fall within the interquartile range of prices determined under the best transfer pricing method (§1.482-1(e)).
**Division 2:** \[
\begin{align*}
\max_{X_{12}^p} (1-t_2)\Pi_2 & \quad \Rightarrow \quad (1-t_2)\left[\bar{P}_2 - \gamma_2 - P_{12}\right] = 0. \quad (10)
\end{align*}
\]

Top management chooses the transfer price to maximize \(\Pi_{\text{MNC}}\), given known division supply and demand curves.\(^6\) Bond calculates top management’s first-order condition and evaluates it at the equilibrium transfer price, \(P_{12}^0\), is

\[
\frac{d\Pi_{\text{MNC}}}{dP_{12}} \bigg|_{P_{12}=P_{12}^0} = X_{12}^{p}(t_2-t_1).
\]

(11)

Bond concludes that when \(t_2 > t_1\), \((t_2 < t_1)\), top management raises (lowers) the transfer price from \(P_{12}^0\) to maximize \(\Pi_{\text{MNC}}\). Bond’s (1980) decentralized analysis raises the possibility of a transfer price within, rather than on, the arm’s length boundary. Top management, limited by a probable fall in intra-firm trade, adjusts the transfer price by less than the maximum allowed by tax law.

We extend Bond (1980) to allow the transfer price to take any value within the arm’s length constraint (i.e., it can differ from \(P_{12}^0\)). Like Bond, profit-maximizing division managements under DDM react to changes in the centrally-determined transfer price by adjusting their respective intra-firm quantities supplied and demanded. The direction of the quantity’s response to changes in the transfer price depends on whether the MNC operates along division 1’s supply curve or division 2’s demand curve. Given the significance of intra-firm trade, we assume top management hires a competent consultant to determine the arm’s length range (if not already known) and, therefore, can and does select a transfer price on, or within, the arm’s length boundary.

---

\(^6\) In Hirshleifer (1956, 1964), this perfect information assumption would allow a neutral umpire to choose the internal equilibrium transfer price, \(P_{12}^0\), without an iterative process.
Top management’s first-order condition for profit maximization implicitly defines the optimal transfer price. The total differential of the first-order condition generates the comparative static results as follows:

$$\frac{\partial P_{12}^*}{\partial t_1} = \frac{(P_{12} - C_i)X_{12} + X_{12}}{CC}; \text{ and}$$

$$\frac{\partial P_{12}^*}{\partial t_2} = \frac{(P_2 - \gamma_2 P_{12})X_{12} - X_{12}}{CC},$$  \hspace{1cm} (14)

where $CC = (t_1 - 1) \left[ \left( X_{12} \right)^2 C_i \right] + (t_2 - 1) \left[ \left( X_{12} \right)^2 \gamma_2 \right] + 2 X_{12} (t_2 - t_1) < 0$.  \hspace{1cm} (15)

Along the supply (demand) curve, division 1’s (2’s) first-order condition for division profit maximization, $(P_{12} - C_i) = 0$ $(\overline{P_2} - \gamma_2 P_{12} = 0)$, holds. The following tax conditions also hold when the MNC operates along the supply (demand) curve: $t_1 > t_2$ ($t_1 < t_2$). The slope of the supply (demand) curve is $X_{12} = X_{12} > 0$ ($X_{12} < 0$). In internal equilibrium, the MNC operates at the intersection of division 1’s supply curve and division 2’s demand curve, satisfying each division’s first-order conditions as well as the tax condition that $t_1 = t_2$. When $t_1 = t_2$, the comparative static results, which correspond to Bond’s (1980) conclusion, reduce to

$$\frac{\partial P_{12}^*}{\partial t_1} = \frac{X_{12}}{CC} < 0 \text{ and } \frac{\partial P_{12}^*}{\partial t_2} = -\frac{X_{12}}{CC} > 0.$$  \hspace{1cm} (16)

When $t_1 > t_2$, the MNC operates along the internal supply curve and the comparative static results reduce to

---

7 See Appendix A for a derivation of the sign of $CC$.
8 See Appendix A for a derivation of the tax conditions.
\[
\frac{\partial P_{12}^*}{\partial t_1} = \frac{X_{12}}{CC} < 0 \quad \text{and} \quad \frac{\partial P_{12}^*}{\partial t_2} = \frac{\left(P_2 - \gamma_2 - P_{12}\right)X_{12} - X_{12}}{CC} > 0.
\] (17)

When \( t_1 < t_2 \), the MNC operates along the internal demand curve and the comparative static results reduce to

\[
\frac{\partial P_{12}^*}{\partial t_1} = \frac{\left(P_{12} - C_i\right)X_{12} + X_{12}}{CC} < 0 \quad \text{and} \quad \frac{\partial P_{12}^*}{\partial t_2} = \frac{-X_{12}}{CC} > 0.
\] (18)

As a more general result, we conclude that whether \( t_1 = t_2 \) or \( t_1 \neq t_2 \) the sign of equation (14) is always negative and the sign of equation (15) is always positive.\(^9\) The signs of the comparative static results do not depend on differences in organization structure (i.e., CDM versus DDM). Their magnitudes probably differ, however, because the decentralized MNC’s top management may not select the highest or lowest transfer price allowed by tax law.

5. Optimal Negotiated Transfer Pricing

Centralized transfer pricing presumes top management possesses perfect (or at least very good) information about its divisions (i.e., it knows each division’s reaction function) so that it can choose the optimal transfer price and quantity of intra-firm trade (Hansen and Kimbrell 1991, p. 84). Adopting a decentralized corporate structure copes with the agency costs associated with “impacted information” (Williamson 1975) at the division level. As Hansen and Kimbrell (1991) note, top management’s “limited and untimely access to local information and cognitive limitations are key reasons why firms decentralize!” (p. 84). Furthermore, negotiated transfer pricing is more common in practice (Vaysman 1998; Chalos and Haka 1990; Eccles 1985; Price Waterhouse 1984; Tang, Walter, and Raymond 1979; Wu and Sharp 1979; Vancil 1978).

\(^9\) Dawson (1999) shows that the qualitative results hold for general functional-form supply and demand curves (pp. 97-100, 108).
Therefore, we relax the centralized transfer pricing assumption in this section. The existing literature concludes that no transfer price can resolve the conflict between goal congruence and division autonomy (e.g., Hansen and Kimbrell 1991, p. 79). We show that, under a tractable bargaining structure, a firm-wide optimal solution, the modified Horst (1971) CDM solution, can occur.

The Domestic Divisionalized Firm Facing Equal Tax Rates

Hirshleifer (1956, 1964) modeled a domestic divisionalized firm facing an identical corporate profit tax rate in each state or region where it operates. Therefore, in equation (1’), \( t_1 = t_2 \).

Division managements choose the transfer price through negotiation (i.e., negotiated transfer pricing) and the quantity of intra-firm trade (and division output). Under Hirshleifer’s assumption of equal tax rates, \( P_{12}^0 \) equals the profit-maximizing transfer price, where, at \( P_{12}^0 \), the following maximizing conditions (Hirshleifer 1964, p. 31) hold:

1. Division 1: \( P_{12} = C_1' \),

2. Division 2: \( P_{12} = \bar{P}_2 - \gamma_2' \), and

3. Firm-wide: \( X_{12}^* = X_{12}^d = X_{12} \). \(^{10}\)

No guarantee exists that autonomous divisions will choose a negotiated transfer price and intra-firm quantity of \( P_{12}^0 \) and \( X_{12}^0 \), however. Rational division managements may exploit their internal (monopolistic or monopsonistic) market power. To overcome potentially dysfunctional

\(^{10}\) At \( P_{12}^0 \), we encounter “marginal cost pricing for the intermediate product”, since the transfer price equals division 1’s marginal cost, \( C_1' \), which Hirshleifer (1956) clarifies by noting “the sum of the divisional marginal costs equal to price (in the perfectly competitive case) or marginal revenue (in the imperfectly competitive case) in the final market” (p. 175) (i.e., \( C_1' + \gamma_2 = \bar{P}_2 \)). Also, division 2’s marginal cost, \( \gamma_2' \), equals division 2’s net marginal revenue, \( \bar{P}_2 - P_{12} \).
effects, Hirshleifer (1956, 1964) suggests a “neutral umpire” (or “auctioneer”) to facilitate the transfer price negotiations through an iterative process. Even though a neutral umpire aims to minimize the exercise of internal market power, rational divisions possess an incentive to misinform the neutral umpire “in the hopes of achieving a more favorable price” (Hirshleifer 1964, p. 32). Under conditions of imperfect information, top management chooses a transfer pricing rule or bargaining structure (e.g., a neutral umpire) intended to lead autonomous divisions to choose $P_{12}^0$ (and thus $X_{12}^0$).

Hansen and Kimbrell (1991) analyze a domestic divisionalized firm’s ability to achieve an efficient level of intra-firm trade under negotiated transfer pricing. Unlike Hirshleifer (1956, 1964), they assume top management has complete information about division operations, but, because it “does not possess the cognitive capability to process the information on a timely and accurate basis” (p. 82), it delegates authority over operating decisions to division managements. Division managers know division 1’s marginal cost function (i.e., internal supply curve) and division 2’s net marginal revenue function (i.e., internal demand curve)\(^{11}\), know a potential joint benefit exists through cooperation in the negotiations (p. 87), and know how to process the relevant information efficiently and effectively. “The difference between the optimal profits and the achieved profits of the two divisions is a [potential] joint benefit” (p. 85). Hansen and Kimbrell (1991) conclude that rational division managers, who “possess sufficient information” (p. 81), will select the firm-wide optimal intra-firm quantity of trade (and final output) without “any intervention of the central authority” (p. 81). Weak rationality ensures that not only will they cooperate when they expect to earn a higher division profit (and a higher performance-based compensation payment) than they would without cooperation, they cooperate even when they
expect to earn exactly what they would without cooperation.\textsuperscript{12} Hansen and Kimbrell (1991) do not form a conclusion or make an assumption with respect to what determines the negotiated transfer price within the negotiation set. Implicit in their analysis, we believe, is the assumption that the transfer price will be selected in a fair manner. The transfer price provides “the mechanism used to assign the cooperative gain to each division” (p. 87), meaning it is used for both performance evaluation and tax reporting purposes. Since tax rates are equal for the domestic divisions, the transfer price allocates the joint gain in division profit without adversely affecting the firm’s overall after-tax profit.

Vaysman (1998) extends Hansen and Kimbrell (1991) to include private division information and a bargaining structure that includes top management intervention to select the transfer price (i.e., centralized transfer pricing) should a negotiation impasse occur at (or before) the negotiation period ends. The transfer price computes division profits for financial and tax reporting, as well as division profit for performance evaluations. Division managers receive at least their reservation division profit levels (and, correspondingly, their reservation performance-based compensation) to ensure that they do not refuse to produce and conduct intra-firm trade. Presumably, these reservation levels are their conflict payoffs, or the division profit they would earn without cooperating. Because of the assumption of incentive compatibility, Vaysman’s upper bound on profits is quantitatively equivalent to the profits earned by the MNC in the modified Horst (1971) solution.\textsuperscript{13}

\textsuperscript{11} Knowledge of the internal supply and demand curves gives division managements the capability, although not necessarily the incentive, to choose the optimal quantity of intra-firm trade.

\textsuperscript{12} In other words, the “concession limits” define the bounds of the “negotiation set” (p. 86).

\textsuperscript{13} A “centralized decision-making scenario [is] used to compute the upper bound on profits” (p. 373) by hypothesizing an “incentive-compatible direct-revelation mechanism” (p. 355), which is characterized by division managers truthfully reporting all private information to top management (pp. 355, 356).
We question the content of Vaysman’s (1998) private division information assumption because, although division managers possess private information not known to other division managers, they do know the other division’s relevant information. Each division manager knows division 1’s supply curve and division 2’s demand curve, which is the relevant information needed to select the optimal quantity of intra-firm trade, $X_{ij}^0$. Vaysman’s “asymmetric information” (p. 354, footnote 2) assumption does not appear to be materially different than Hansen and Kimbrell’s (1991). In addition, we question the need for the assumption of “extensive-form negotiations” (p. 372) “over the transfer price” (p. 358) where the “manufacturing manager is induced to reveal all private information before bargaining begins” (p. 372). It may be redundant, since each division already knows the relevant cost and revenue information by prior assumption.

We also question Vaysman’s (1998) assumption that centralized intervention in the event of a negotiation impasse is necessary to guarantee cooperation. If, as Hansen and Kimbrell (1991) assume, division managers are weakly rational, then division managers (weakly) prefer to cooperate even when they expect to earn only their conflict payoff. Also, with Vaysman’s assumption that negotiation impasse leads to no intra-firm trade, no final good production, and no division profit (and probably a loss), Hansen and Kimbrell’s (1991) weak rationality becomes strict rationality. That is, when faced with zero performance-based compensation, division managers would strictly prefer to cooperate and receive at least some performance-based

14 “The firm’s accounting system records realizations of costs and revenues” (p. 353) and “makes them available to all parties” (p. 354).

15 Vaysman (1998) uses “a particular extensive-form scenario … to analyze the process of manager’s negotiation over the transfer price” (pp. 357-358) because the “Accounting literature does not provide empirical evidence on the exact nature of bargaining that takes place in negotiated transfer-pricing arrangements” (p. 358). He adopts “the buyer-offer extensive form to represent the bargaining that takes place over the transfer price” (p. 359).
reward. Impasse and no production/sales might also lead to layoffs and/or division shut down, bringing a manager’s base compensation to zero as well, further supporting a strict preference for cooperation and production. Alternatively, should a vertically integrated MNC allow division 2 to source inputs from the outside market (to fulfill its final good sales orders) when negotiation impasse interrupts intra-firm trade, division 2’s supplier-switching costs may make it strictly preferable to cooperate even when it expects to earn its conflict payoff. Furthermore, Vaysman (1998) rules out the need for central intervention to guarantee cooperation by making the explicit assumption that “whenever an agent is indifferent between various actions, the agent selects the action preferred by HQ” (p. 354).

Both Hansen and Kimbrell (1991) and Vaysman (1998) do not consider how the perceived fairness of the negotiated transfer price can affect a domestic divisionalized firm’s overall profit. In their analyses, the transfer price does not affect the firm’s overall (before-tax or after-tax) profit and, therefore, it can be used to divide the joint profit gain in combined division profit (if any). But what determines the negotiated transfer price? Is the process fair? “[M]anagers believe they are being treated fairly when they receive rewards that they believe are commensurate with their contribution to the company” (Eccles 1985, p. 270). If (as we assume below) bargaining outcomes predominantly reflect relative bargaining abilities or positions, no guarantee exists that both division managers will view the negotiated transfer price as fair. Rational division 1 (division 2) management will respond to an unfair low (high) negotiated transfer price by reducing the intra-firm quantity supplied (demanded), thereby reducing the

16 We implicitly assume each division expects to be profitable under a production scenario, so that performance-based compensation is relevant.
intra-firm quantity and final good output below their firm-wide optimal levels. This result undermines their resource efficiency conclusions.

In Hansen and Kimbrell (1991) and Vaysman (1998), divisions first cooperate in their negotiations to select the optimal firm-wide quantity of intra-firm trade, $X_{12}^\theta$. The transfer price then allocates the joint gain in combined division profit (if any). This sequence of negotiation events is not rational, however. Assuming top management wishes to alleviate dysfunctional negotiation behavior, we need to characterize DDM by the delegation to division managements’ the authority to choose the intra-firm quantity and transfer price, and to determine the sequence in which they select those variables. Rational division managers will not agree to select the intra-firm quantity first. Given the binding and enforceable nature of the negotiation agreement, the relatively weaker-bargaining division management cannot renege on the intra-firm quantity agreement in the event of an unfair transfer price. For example, if division 2 experiences a relatively weaker-bargaining position, the negotiated transfer price will exceed the equilibrium transfer price, and it pays more than what it views as a fair price for the intra-firm good. As such, it will maximize its division profit, given the unfairly high transfer price, by selecting a quantity of intra-firm good demanded up along its internal demand curve, a lower quantity than equilibrium. Since it stands to receive the greatest share of the cooperative gain, the relatively stronger bargaining division will not challenge the decision sequence of transfer price followed by intra-firm trade because it does not want to forgo the opportunity of a joint gain in its division

---

17 Although not specifically modeled in our basic analysis, division 1 (division 2) could reduce the quality of the intra-firm product (its marketing efforts or expenditures) if division managers view the negotiated transfer price as unfairly low (high), which would contribute to a lower division 2 sales volume. Vaysman’s (1998) productivity parameter, $z_i$, which is a shift parameter, could capture these effects.
profit. In a dynamic, period-after-period bargaining game, this rational behavior should become more evident in subsequent periods, given an unfair outcome in the first period.

*The MNC Facing Unequal Tax Rates*

Halperin and Srinidhi (1991) extend Hansen and Kimbrell (1991) to the international case with differential tax rates. Like Hansen and Kimbrell (1991) and Vaysman (1998), they assume divisions know each other’s cost and revenue information. Halperin and Srinidhi (1991) consider the case of an explicit endogenous arm’s length constraint, either determined by the Resale Price Method or Cost-Plus Method, that the MNC can adjust through the intra-firm quantity or output. This extension is beyond the scope of this paper, however. We assume an implicit exogenous arm’s length constraint. Halperin and Srinidhi’s (1991) scenario with no arm’s length constraint, however, is relevant here.

Under an implicit arm’s length range with an exogenous upper and lower bound, Halperin and Srinidhi’s (1991) no arm’s length constraint case is as follows. Rational division managers cooperate to select the equilibrium quantity of intra-firm trade, $X_{12}^0$, based on complete knowledge of cost and revenue functions, binding and enforceable agreements, and preferences unresponsive to the process of negotiation (presumably, an unfair negotiation process does not change preferences). The transfer price allocates the joint gain (if any) in combined division profit. Complete knowledge of each division’s reaction function gives division managements the ability, *but not necessarily the incentive*, to cooperate and select the optimal intra-firm quantity and transfer price. The negotiated transfer price depends on the divisions managers’ relative negotiating strengths, so there is no guarantee that the transfer price will fall on the upper or lower arm’s length boundary. Since the same transfer price affects taxes and bonuses paid, the MNC will not maximize total after-tax profits. In other words, the finding
in Halperin and Srinidhi (1991) does not achieve the modified Horst (1971) CDM result.

Halperin and Srinidhi’s (1991) decentralized MNC may not achieve resource efficiency (i.e., internal equilibrium and a maximum pre-tax profit) either. Like Hansen and Kimbrell (1991) and Vaysman (1998), Halperin and Srinidhi (1991) do not incorporate the negative incentive effects created by a perceived unfair transfer price that reflects bargaining abilities rather than a division’s relative contribution or value-added to the firm. Not only will the MNC’s after-tax profits fall below the modified Horst (1971) profit due to a transfer price determined by bargaining power (and, therefore, not necessarily on the arm's length boundary), but also a perceived unfair negotiated transfer price can reduce the quantity of intra-firm trade too.

An Alternative Approach

Our negotiated transfer pricing model builds upon the strengths of Hansen and Kimbrell (1991), Vaysman (1998), and Halperin and Srinidhi (1991). We consider a decentralized MNC’s ability and incentives to achieve the modified Horst (1971) solution assuming (1) the existence of private division information between division managements, (2) a recognition by divisions that a positive-sum game exists, (3) the negotiated transfer price reflects relative bargaining abilities (Halperin and Srinidhi 1991), (4) unfair transfer prices adversely affect division manager incentives, and (5) the negotiated transfer price does not allocate the joint gain in division profit. Our material departures from Hansen and Kimbrell (1991), Vaysman (1998), and Halperin and Srinidhi (1991) include assumptions (1), (4), and (5).

The MNC faces different effective international tax rates, division management performance-based compensation that depends on division profit (and, implicitly, division manager utility directly that relates to compensation), division managements with private information about their respective division’s operations and market (including private
information about their costs and revenue functions), divisions that play a positive-sum game in their negotiations, and a negotiation impasse at (or before) the end of the bargaining period that triggers a default transfer price (e.g., last period’s transfer price) or a centrally-determined transfer price (i.e., centralized transfer pricing). Under DDM, division managers retain the authority to reduce their quantity of intra-firm trade should they face an unfavorable transfer price, even under negotiation impasse.

Under the conventional assumption that taxable income and performance evaluation depend on the transfer price, Hansen and Kimbrell’s (1991) decentralized domestic firm achieves an optimal firm-wide quantity of intra-firm trade. Under the same assumption, Halperin and Srinidhi’s (1991) MNC’s transfer price minimizes the MNC’s global tax payments as well as divides the joint gain in combined division profit, probably leading to a sub-optimal negotiated transfer price because no guarantee exists that the negotiated transfer price will fall on the upper or lower arm’s length boundary. By contrast, we do not use the transfer price as a sharing mechanism for the joint gain (or loss), so it does not affect division profit and performance-based compensation. The negotiated transfer price only minimizes the MNC’s global tax liability (subject to the arm’s length constraint). When relative bargaining power determines the transfer price, it can adversely affect manager morale, effort, and productivity.18 Solutions to this agency-cost problem include, for example, Choi and Day’s (1998) conclusion that top management can address the tradeoff between tax avoidance and management incentives by using incentive

18 When top management cannot observe division managements’ behavior and effort perfectly and division managements receive their reward based on division profit, top management’s task of coordination within the firm proves more complicated because its “desire to use the transfer price to minimize the MNC’s global tax liabilities may encourage slack effort by its subsidiaries’ managers” (Donnenfeld and Prusa 1995, p. 231). “[I]f a [transfer pricing] method is chosen to give an advantage for tax purposes, then the use of the results of subsidiary operations for performance evaluation of managers may yield unfair results, causing managerial conflict and morale problems. This potential conflict between the transfer pricing method chosen and a fair performance evaluation is a primary concern in the MNC” (Borkowski 1992, p. 174)
compensation based on multiple performance measures. In our negotiated transfer pricing model, division management performance evaluation depends on division performance evaluation profit, which is not calculated using the negotiated transfer price. This removes the transfer price as a source of agency costs and sub-optimality. In a bargaining structure that separates transfer price and performance evaluation decisions, the modified Horst (1971) CDM solution reemerges. Some agency costs may remain (e.g., agency costs associated with how the firm allocates the joint gain between divisions), but they do not relate to the transfer price. The form of the allocation mechanism, which division managements may or may not view as fair, is not critical to our analysis.

We assume private division information between division managements (and between divisions and top management) concerning each division’s respective cost and revenue functions, reaction (supply and demand) functions, other relevant operating information and markets. Divisions may share this private information with each other, if faced with adequate incentives to do so. Division managements possess common knowledge or publicly-available information, including information publicly-available within the MNC (e.g., their negotiations generate a positive-sum). Division managements exhibit bounded rationality, but exercise due diligence when making management decisions to operate their divisions competently.

Top management implements the following two-stage bargaining structure. In stage 1, division managements negotiate the transfer price and quantity of intra-firm trade (and the sequence in which they are negotiated) to maximize the combined after-tax division profit and, thus, the joint gain in after-tax division profit. In stage 2, division managements negotiate the split in joint gain (or loss). The motivation to cooperate to maximize the joint after-tax division profit reflects a combination of assumptions: (1) Performance evaluation depends on division
profit, (2) performance evaluation does not depend on the negotiated transfer price; (3) division managements are rational; (4) division managements negotiate the transfer price and quantity of intra-firm trade (as well as the sequence of their decisions); (5) divisions know that negotiations take place in a positive-sum game; (6) the length of the bargaining period is limited; and (7) negotiation impasse triggers the use of centralized transfer pricing or a default transfer price.

Assumption 2 ensures that the negotiated transfer price does not cause agency costs. Under these assumptions, cooperation dominates a negotiation impasse and a cooperative solution obtains. If a negotiation impasse triggers centralized transfer pricing, top management chooses a non-equilibrium transfer price (i.e., $P_{12}^{\text{Cent}} \neq P_{12}^0$) inside (or on) the arm’s length boundary, which leads autonomous division managements to select a sub-optimal, non-equilibrium quantity of intra-firm trade (i.e., $X_{12}^{\text{Cent}} < X_{12}^0$). With cooperation, division managements negotiate a transfer price, $P_{12}^{\text{Neg}}$, at either the upper or lower arm’s length boundary (a boundary solution), since this maximizes the joint gain in after-tax division profit, ceteris paribus, that they will divide in stage 2. They choose the highest (lowest) allowable transfer price when $t_1 < t_2$ ($t_1 > t_2$), ceteris paribus, which equals the upper (lower) arm’s length boundary. They also choose $X_{12}^{\text{Neg}} = X_{12}^0$.

---

19 Hansen and Kimbrell (1991) suggest three reasons why division managements know that negotiations are positive-sum: “(1) the role of a central authority in supplying information; (2) the expectation that a responsible divisional manager will gather information about his operating environment; and, (3) open communication which will likely lead to an exchange of information that, in turn, will lead to a mutual recognition of a joint benefit (in support of this notion, well documented examples of collusion among competing firms in open markets must be considered)” (p. 96).

20 If last period’s transfer price is the default for negotiation impasse, and it happens to equal this period’s equilibrium transfer price, the divisions achieve internal equilibrium. The divisions, however, do not reach the optimal transfer price (either on the upper or lower arm’s length boundary). If last period’s transfer price happens to equal this period’s optimal transfer price (i.e., on the upper or lower arm’s length boundary), the quantity of intra-firm trade is less than optimal.

21 Since we do not assume identical firms and/or identical tangible products, the exogenous arm's length range does not necessarily relate, in a predictable manner, to the subject MNC's internal equilibrium transfer price (or the cost and revenue functions that underlie it). The arm's length range probably straddles the subject MNC's internal
because it maximizes the joint gain in after-tax division profit, ceteris paribus.

Although each division management possesses private information, the existence and knowledge of the positive-sum game (reinforced by a strictly inferior negotiation impasse profit) produces the incentive for rational division managements to cooperate and share relevant information, information that allows them to select the equilibrium intra-firm quantity of trade and the transfer price on the arm’s length boundary. Notice that, unlike Hirshleifer (1956, 1964), Hansen and Kimbrell (1991), Halperin and Srinidhi (1991), and Vaysman (1998), an optimum result does not depend on complete information between division managements. Under incomplete or private information, division managements, in pursuit of economic self-interest, cooperate and reveal to each other their respective reaction functions, other relevant operating and market information, and share transfer pricing studies prepared by outside experts (if not already shared).

In stage 2, divisions divide the joint gain (loss) in division after-tax profit. Bargaining outcomes probably reflect each party’s relative bargaining power (Chalos and Haka 1990; Chatterjee and Samuelson 1987; Abdel-Khalik and Lusk 1974; and Dupuch and Drake 1964). Thus, division managements’ relative bargaining strength determines the allocation of the joint gain. This assumption is not critical to our analysis, however. To consider fairness, top management could, as part of its authority to determine management compensation, calculate each division’s share of the joint gain using the known\textsuperscript{22} internal equilibrium transfer price, $P_{12}^0$.

\textsuperscript{22} Assume top management shares each division manager’s revealed costs/revenues with division managers. Division managers cannot successfully misinform top management, since they truthfully share information with each other.

\textsuperscript{22} Assume top management shares each division manager’s revealed costs/revenues with division managers. Division managers cannot successfully misinform top management, since they truthfully share information with each other.

\begin{footnotesize}
\begin{itemize}
  \item equilibrium transfer price in many cases, assuming a fairly good set of comparable companies and/or comparable products are used to estimate the arm's length range (e.g., see the horizontal dashed lines in Figure 2). The quality of our results are unaffected by this assumption.
  \item Assume top management shares each division manager’s revealed costs/revenues with division managers. Division managers cannot successfully misinform top management, since they truthfully share information with each other.
\end{itemize}
\end{footnotesize}
Nevertheless, the negotiated transfer price agreed to in stage 1 remains on the upper or lower arm’s length boundary because that price (along with $X_{ij}^0$) maximizes the combined after-tax division profit. Autonomous divisions split the joint gain (loss) in stage 2 using another method, not involving the transfer price. For performance evaluation purposes, top management enters into its division management compensation program a measure of division profit that adjusts for the negotiated allocation of the joint gain (loss).\textsuperscript{23} If divisions view the negotiated split as unfair, this does not affect the negotiated transfer price on the arm’s length boundary.

Compliance with tax law requires that the decentralized MNC choose the transfer price on, or within, the arm’s length boundary, but not outside it. By selecting a negotiated transfer price on the arm’s length boundary, top management minimizes the MNC’s global tax burden (i.e., tax avoidance) while not evading its tax responsibility. The MNC reports each division’s before-tax (i.e., taxable) arm’s length profit on its tax return in each country (or on a consolidated tax return) using the negotiated transfer price.

6. Licensing Intangible Assets Intra-Firm

MNC intra-firm transfers of intangible assets are extensive. Such transfers, arguably, constitute the most important aspect of MNCs’ internal trade, because "Wealth and growth in today's economy are driven primarily by intangible (intellectual) assets" (Lev 2001, p. 1). Nonetheless, “little research addresses transfer pricing for intangibles” (Johnson 2006, pp. 339-340). To our knowledge, four papers directly analyze the economics of transfer pricing for international intra-firm transfers of intangible assets, Horst (1973), Halperin and Srinidhi (1996), Boos (2003), and

\textsuperscript{23} Typically, MNCs use the same transfer price for performance evaluation and tax purposes because of the resources needed to implement a dual set of accounting books and the increased likelihood of a (or scrutiny in an existing) tax audit (Czechowicz et al. 1982, p. 61). With our bargaining structure, a second set of accounting books is not needed. See Appendix B.
The Nature of Intangibles

An intangible asset transfer can involve a license grant of the right to its use, or an outright sale. We focus on the license of division 1’s intangible asset(s) intra-firm to division 2. Intra-firm licensing of intangibles reflects a centralized ownership strategy, where both legal and beneficial ownership lies with one company in a controlled group (as opposed to a joint, or distributed, ownership strategy, where one company holds legal ownership but both companies share beneficial ownership) (Adams and Godshaw 2002). A licensing strategy provides the greatest opportunity for an MNC to shift profits, because when several companies within a controlled group legally own separate intangibles (or separate baskets or blocks of intangibles), “exploitation within the group is by way of a myriad of cross-licenses between operating companies” (Adams and Godshaw 2002, p. 77). The number and total (dollar) value of cross-licensed intangibles makes the transfer pricing analysis complex and burdensome for tax authorities to audit, thereby creating a lower probability of a tax audit or an irrefutable tax adjustment in an audit.

Lev (2001) argues that intangible assets incorporate partial excludability and nonrivalry. By their very nature (i.e., many are knowledge-based assets), the mere possession of an intangible asset does not exclude third parties from also possessing and using it. Methods exist to exclude third parties from using one’s intangible asset, most notably enforceable legal protection afforded by patents and property rights. Many firms adopt informal measures to protect their

---

24 In related work, Kopits (1976) estimates the loss in tax revenues generated by abusive transfer pricing practices with respect to intra-firm royalties and license fees by U.S. firms operating, through direct investment, in several industrialized and less developed host countries using 1968 data. Also, Grace and Berg (1990) examine cost sharing of R&D expenses within the MNC to shift profit.
intellectual property and intangible assets, such as keeping them a trade secret, making it difficult for competitors to extract usable information through reverse engineering, and requiring employee confidentiality agreements. Still, such means erect imperfect barriers to free use. Expecting an unduly rapid dissemination of proprietary intangibles, firms also seek to create competitive advantages through lead time, the learning curve, and marketing strategies. These strategies foster company and brand loyalty to create barriers to the effective marketing and sale of third-party products that use their intangible assets.

Intangible assets are also nonrival in consumption. Nonrival intangible assets entail a zero or negligible marginal cost of producing each additional unit, however measured, of the intangible (Di Tommaso, Paci and Schweitzer 2004). Once division 1 incurs the fixed (or sunk) R&D cost of creating an intangible asset, the intangible exists and the right to its use can transfer to division 2 with zero (or negligible) marginal production cost to division 1 (Lev 2001).

Literature Review

Horst (1973) considers a transfer of a tangible product that embodies division 1’s intangible asset. In the ordinary course of business, however, division 1 does not transfer to division 2 the right to exploit commercially the intangible asset, except, as is customary in the sale of a product, to identify the product feature, trademark, or trade name to market and sell the product. No intra-firm royalty payment is applicable under the arm’s length standard, since rights to the intangible asset do not transfer to division 2 (Reilly and Schweih 1998, p. 472).25 By contrast,

25 Typically, for tangible products with product differentiation created by a valuable intangible feature, the wholesale price exceeds that of non-differentiated substitute goods. The final 1993 U.S. transfer pricing regulations in §1.482-3(f) “include an express statement that imbedded intangibles will not be considered a transfer of the intangible if the controlled purchaser does not acquire any rights to exploit the intangible, other than the right to resell the tangible property under normal commercial practices” (Cole 2001, Chapter 8, p. 22).
this section considers intra-firm licensing. Although Horst (1973) focuses on different issues, he recognizes “the ‘public good’ nature of technology” (p. 81).

Halperin and Srinidhi (1996) analyze how transfer price determination under three U.S. transfer pricing methods (TPMs) for intangibles influences an MNC’s ability to achieve resource efficiency. They assume CDM, however. In contrast, our analysis assumes DDM with a predetermined, exogenous arm’s length range.

Boos (2003) analyzes an MNC’s international transfer pricing for intra-firm licensed intangibles under the assumptions of CDM and complete information. Boos concludes that we cannot determine the unconstrained intra-firm royalty rate, and the MNC chooses the highest (lowest) allowable royalty rate when \( t_1 < t_2 \) \((t_1 > t_2)\), which is the modified Horst (1971) CDM result. Boos assumes, however, positive marginal costs for producing each unit of a public good intangible, including a cost-influencing intangible (such as a new process technology, pp. 44-46) and a demand-influencing intangible (such as a new product technology or a marketing intangible, pp. 49-50). The nature of public good intangibles, however, typically involve zero marginal cost.

Johnson (2006) considers transfer pricing for intangibles under DDM, focusing on the effects of different internal transfer pricing policies on the efficiency of each division’s R&D

---

26 Under §1.482.4(a), the calculation of an arm’s length royalty for intangibles may use one or more of four TPMs: The Comparable Uncontrolled Transaction method (§1.482-4(c)), the Comparable Profits method (§1.482-5), the Profit Split method (§1.482-6), or unspecified methods (§1.482-4(d)).

27 In Boos (2003), the variable cost of producing a new process technology is \( V(T) \): “The costs of producing the technology \( T \) are \( V(T) \) where \( \frac{\delta V}{\delta T} > 0, \frac{\delta^2 V}{\delta T^2} = 0 \)” (p. 45). The variable cost of producing a new product technology or a marketing intangible is \( V(M) \) (p. 49). Boos simplifies by assuming “trademark \( M \) as [the] reference intangible for both [a] technology and marketing intangible” (p. 49). Presumably, comparable to a new process technology, \( \frac{\delta V}{\delta M} > 0 \) (pp. 49-50).
investment decision. Johnson, however, focuses on the intra-firm sale of intangibles rather than their license.\textsuperscript{28}

\textit{Intra-Firm Licensing of Intangible Assets}

This section considers the relative strength of an MNC’s incentives to choose a transfer price for intangibles outside the arm’s length boundary. An important part of this analysis involves the nature of intangibles. For any given intra-firm quantity of the intangible asset licensed to division 2, division 1’s marginal cost of supplying the intangible asset under license equals zero. This assumption, combined with our negotiated transfer pricing bargaining structure, produces an extraordinary result. An MNC earns a higher after-tax profit licensing its intangible(s) intra-firm because, not only do divisions negotiate a transfer price on the arm’s length boundary, but also they negotiate the equilibrium quantity (however measured) of intra-firm trade, a much larger quantity than in the case of tangibles.

With intra-firm goods or service trade, $P_{12}$ equals the price-per-unit of the intra-firm good or service, $X_{12}$, that division 2 uses in its production and sale of the final good, $Y_2$. When intra-firm trade involves a licensed intangible asset, $P_{12}$ equals the royalty-per-unit of the intra-firm intangible asset, $X_{12}$, used by division 2 in its production and sale of the final good, $Y_2$. Since, in practice, it is difficult to measure the actual quantity of the licensor’s intangible asset used by the licensee, $X_{12}$, the typical royalty links to the quantity of the final good sold, $Y_2$. Further, to better reflect the marginal increase in market power or profitability enjoyed by the

\textsuperscript{28} Johnson (2006) assumes that the intra-firm intangible transfer reassigns ownership, as indicated by various references to the seller and buyer (rather than to a licensor and licensee) and to the initial and final owner. Johnson assumes that the purchase price takes the form of a royalty rate because U.S. tax law favors using a royalty rate for transfers of intangibles (p. 345, footnote 13). Presumably, she refers to §1.482-4(f)(1).
licensee through its use of the licensor’s intangible asset, typically the royalty base equals the licensee’s sales revenue, \( P_2 Y_2 \). We assume that the royalty applies to 100 percent of division 2’s sales revenue, \( P_2 Y_2 \) (which accrues separately from the sales of its other products). Without the license, division 2 would not produce or generates sales receipts for the final good.\(^{29}\) The total royalty payment per period, \( R \), equals the royalty rate, \( r_{12} \), times the royalty base, \( P_2 Y_2 \):

\[
R = r_{12} \left( P_2 Y_2 \right).
\]

The royalty-per-unit of the final good sold by division 2 equals \( r_{12} P_2 \), which also equals the transfer price (i.e., \( P_1 = r_{12} P_2 \)). By convention, we assume that \( Y_2 = f(X_{12}) = X_{12} \).

Thus, the royalty-per-unit, \( r_{12} P_2 \), reverts back to the royalty-per-unit of the intangible asset used by division 2, \( X_{12} \). With \( P_1 = r_{12} P_2 \) and \( X_{12} = X_{12} \left(P_2; P_2 \right) = X_{12} \left(r_{12}; P_2 \right) = X_{12} \left(r_{12} \right) \), equations (2’) and (3’) become

\[
\Pi_1 = r_{12} P_2 X_{12} - C_1 \left(X_{12} \right) \quad (2'')
\]

\[
\Pi_2 = P_2 X_{12} - \gamma_2 \left(X_{12} \right) - r_{12} P_2 X_{12} \quad (3'')
\]

Due to the nonrival nature of an intangible asset, division 1’s marginal cost of producing additional units of the intangible asset under license equals zero (i.e., \( C'_1 = 0 \)) and remains zero at every quantity of the intangible asset licensed (i.e., \( C'_1 = 0 \)). Figure 2 illustrates this with a horizontal internal supply curve for the intangible asset that is located on the quantity axis. The

\(^{29}\) Division 2 may sell a similar product. For example, if the intangible is a design or new product technology, the new product feature may make an existing product more useful to, and therefore in higher demand by, consumers than the existing product without the new feature. Division 2 would pay a royalty based on the new product’s sales revenue, but also may continue to sell the product without the new feature for which it does not pay a royalty. On the other hand, the intangible may be an improved product feature on an existing product that replaces the old product feature. \( P_2 Y_2 \) would then equal division 2’s incremental sales revenue because it reflects sales of the existing product above its sales absent the licensed intangible.
intangible asset’s past and ongoing development costs, as well as any maintenance costs (such as annual patent fees), remain fixed and do not vary in relation to the quantity of the intangible asset licensed (and in relation to the royalty base, licensee sales revenue).

Division 1’s supply curve, which reflects its marginal cost, intersects the demand curve at a transfer price of zero (refer to \( r_{12} P_2 \) in Figure 2). At this transfer price (and implied royalty rate, \( r_{12}^0 = 0 \)), the optimal quantity of intangible asset licensed intra-firm, \( X_{12}^0 \), is larger than with a positive-sloped supply curve. The tax authorities still constrain the transfer price to lie within a positive arm’s length range (illustrated by the two horizontal dashed lines in Figure 2), such that centralized transfer pricing produces an inefficient quantity of intra-firm trade within the \( X_{12}^{t_1 < t_2} \) - to- \( X_{12}^{t_1 > t_2} \) range (in Figure 2). Under the MNC’s optimal internal transfer pricing policy, negotiated transfer pricing, our bargaining structure creates sufficient incentives for division managements to agree to a transfer price at either the upper or lower arm’s length boundary, and to select the optimal quantity of intra-firm trade, \( X_{12}^0 \). Comparing intra-firm intangible licensing with tangible intra-firm trade, the lawful MNC shifts a larger before-tax profit from one country to another for a given change in its transfer price. For example, regarding a change in transfer price from the upper to the lower arm’s length boundary (i.e., a change corresponding to country 1’s tax rate becoming higher than country 2’s), the profit shift to division 2 equals the area ACDF in Figure 2, while the profit shift for tangible goods trade equals area ABEF.\(^{30}\) For intangible asset licenses, the larger (dollar) profit shift for a given (dollar) transfer price

\(^{30}\) By contrast, if the bargaining structure requires using the transfer price for both tax returns and performance evaluations, relative division bargaining (or market) power likely leads to a negotiated transfer price within the arm’s length boundaries, which leads to a lower-than-equilibrium quantity of intra-firm trade under license, at the point where the transfer price intersects division 2’s demand curve.
adjustment (or for a given tax differential) gives tax authorities in high-tax countries good reason for concern about the potential for transfer pricing abuses. If we adopt the conventional assumption that the negotiated transfer price facilitates both tax reporting and performance evaluation, the MNC would not obtain the potential benefits arising from an intangible's zero marginal cost. With performance evaluation separated from the negotiated transfer price, autonomous divisions choose both an optimal transfer price and intra-firm quantity. A licensed intangible's zero marginal cost becomes markedly more relevant to MNCs when they have the ability to achieve the modified Horst (1971) outcome, an ability provided by our bargaining structure.

When an MNC perceives the arm’s length range as a guideline, rather than a strict constraint, it estimates the probability of a tax audit (or a tax adjustment in an audit) along with the potential tax savings when deciding if, or by how much, to violate the arm’s length range (Kant 1988). In theory, our (implicit) arm’s length constraint is fixed but, in practice, it may vary. The probability of audit (or tax adjustment in audit) relates inversely with the inexact nature of arm’s length transfer price determination and the disinclination of tax enforcement. Given the inexact nature of the valuation and determination of the arm’s length transfer price for intangibles, more room exists to push the envelope than with tangible goods trade. Practitioners know that the relative abundance of comparable uncontrolled transactions makes the determination of the arm’s length range for tangible goods fairly concrete, while the relative lack of comparable uncontrolled license agreements for licensed intangibles makes the estimated arm’s length range for intangibles inherently less reliable and, thus, subject to greater challenge and compromise. In general, less reliable arm’s length price estimates cause taxpayers to
perceive a lower probability of audit (or adjustment when audited) for a given deviation from the arm’s length range. For given incentives to practice transfer pricing abuse, a weaker arm’s length constraint increases the likelihood of abuse, ceteris paribus.

Our analysis shows that MNCs experience a greater incentive to violate the arm’s length range when transferring intangible assets intra-firm under license. For a given tax rate change (or tax rate differential across borders), the larger quantity of intra-firm trade for intangibles raises the potential tax savings for each (dollar) transfer price deviation outside the arm’s length range, strengthening the incentive and potential for transfer price abuse. A perceived weaker arm’s length constraint releases that potential. Tax authorities should audit a greater number of intra-firm intangible asset transactions, and invest greater resources to train tax audit specialists to identify transfer pricing abuses in intra-firm intangibles transactions.

When applying our model in practice, we relax the binding arm’s length constraint assumption. In practice, the type of intra-firm transfer (i.e., tangible or intangible) can affect the nature of the arm’s length range. With tangible products, the availability of comparable (or near-comparable) uncontrolled transactions and prices, as well as the more visible and understandable link between the price of tangible products and their underlying determinants, make the estimation of the arm’s length range relatively transparent. Practitioners hired by MNCs cannot easily move the arm’s length constraint (using alternative TPMs, or applying a given TPM in a different way) or select a transfer price outside a given arm’s length range. With intra-firm intangible licenses, a reliable arm’s length range for the royalty rate proves more difficult to estimate, due to the typical lack of access to privately kept comparable (or near-comparable) license agreements, the lack of comparability (or near-comparability) of available license

31 Governments also experience a greater incentive to engage in tax competition.
agreements (due to the inherently diverse nature of proprietary intangible assets), and the less visible and understandable link between the price of intangible transfers and their fundamental determinants. Thus, subjectivity plays a larger part in royalty-rate determination and less agreement exists about the arm’s length range, such that in practice the arm’s length range tax authorities estimate provides a guideline rather than a binding constraint. Not only are practitioners more willing to move the arm’s length range based on the less precise nature and lower reliability of estimating the arm’s length range for intangibles, MNCs are more willing to take a chance on selecting a transfer price outside the guideline arm’s length range.

7. **Summary**

Under our bargaining structure, the modified Horst (1971) CDM outcome emerges irrespective of an equitable or inequitable allocation mechanism. Even under an allocation mechanism that depends on bargaining power where the divisions wield extremely unequal bargaining powers, the relatively stronger-bargaining division management faces an incentive to offer a concession in stage 2 that makes the relatively weaker-bargaining division’s *performance evaluation profit* at least as much as its non-cooperative performance evaluation profit. Our bargaining structure, which separates performance evaluation from the transfer price decision, provides that incentive. By unlinking the transfer price decision from the division management compensation equation, even under incomplete information a decentralized MNC can achieve the higher after-tax profits equivalent to the modified Horst (1971) CDM outcome. In their negotiations, division managers face sufficient economic incentives—based on that separation—to truthfully share cost and revenue information, giving them the ability to make firm-wide optimal decisions. The separation also creates the incentive to select the firm-wide optimal solution (i.e., a transfer price on the upper or lower arm’s length boundary, and the equilibrium intra-firm quantity). Had we
adopted Hansen and Kimbrell’s (1991) and Vaysman’s (1998) assumption that the firm evaluates division management performance based on the same division profit used for tax reporting, the modified Horst (1971) solution would not emerge. When the negotiated transfer price depends on relative bargaining positions, no guarantee exists that the negotiated transfer price will lie on the arm’s length boundary. Further, in contrast to Halperin and Srinidhi (1991), resource efficiency (i.e., an equilibrium intra-firm quantity) would not necessarily occur either, since the negotiated transfer price would depend on bargaining abilities rather than a division’s actual economic contribution to the MNC’s after-tax profit. The relatively weaker-bargaining division, whose quantity decision would be binding, would maximize division profit by selecting a lower-than-equilibrium quantity of intra-firm trade, given an unfair negotiated transfer price. Should the MNC adopt a fairer mechanism to allocate the joint gain, such as one that would produce an allocation consistent with the equilibrium transfer price, the modified Horst (1971) result would not occur because the equilibrium transfer price would not lie on the arm’s length boundary.

For intra-firm licensing of intangibles under our bargaining structure, we find a greater incentive for MNCs to practice abusive transfer pricing for intangibles than tangibles (as well as a greater incentive for governments to engage in tax competition). When a zero marginal cost associates with supplying/licensing additional units of the intangible, the optimal (i.e., equilibrium) quantity of intangible intra-firm trade (however measured) exceeds that for tangible goods. Therefore, for a given national tax rate differential, MNCs confront a larger potential tax savings, creating a stronger incentive to select a negotiated transfer price outside the arm’s length boundary. This incentive, coupled with the inexact nature of valuing intangibles and their arm’s length transfer prices, implies that, in practice, transfer pricing abuse for intangible transfers probably exceeds that for tangible transfers by a large amount. Therefore, transfer pricing for
intangibles is expected to be a prominent issue for tax authorities, which becomes all the more important as a large portion of international trade occurs through intra-firm transfers, with an increasing portion involving intangible assets.

References:


**Appendix A: Division Reaction Functions:** Division 1’s and 2’s first-order conditions are

\[
\frac{dII_1}{dX_{12}} = P_{12} - C_1 = 0 \quad \text{and} \quad \frac{dII_2}{dX_{12}} = \frac{P_2 - \gamma_2 - P_{12}}{\gamma_1} = 0.
\]

The total differential of these first-order conditions provide the slope of division 1’s supply and
division 2’s demand curve:

\[
X_{i2}^d = \frac{dX_{i2}^d}{dP_2} = \frac{1}{\gamma_2} > 0, \text{ or } \frac{dP_2}{dX_{i2}^d} = \gamma_2 > 0, \text{ and }
\]

\[
X_{i2}^d = \frac{dX_{i2}^d}{dP_2} = -\frac{1}{\gamma_2} < 0, \text{ or } \frac{dP_2}{dX_{i2}^d} = -\gamma_2 < 0, \quad (A2)
\]

where \( \gamma_2 > 0 \) and \( \gamma_2 > 0 \).

**Centralized Transfer Pricing Comparative Statics:** The total differential of top management’s first-order condition is

\[
-[AA] \ dt_t - [BB] \ dt_t + [CC] \ dP_{i2} = 0. \quad (A3)
\]

Solving produces

\[
\frac{dP_{i2}^*}{dt_t} = \frac{AA}{CC} \text{ and } \frac{dP_{i2}^*}{dt_t} = \frac{BB}{CC}, \quad (A4)
\]

where \( AA = \left[ (P_{i2} - C_1') \ X_{i2} + X_{12} \right] \), \( BB = \left[ (P_{i2} - \gamma_2 - P_{i2}) \ X_{i2} - X_{12} \right] \), and

\[
CC = (I - t_1) \left\{ 2 X_{i2}^s \left( X_{i2}^s \right)^2 C_i + (P_{i2} - C_1') X_{i2}^r \right\} + (I - t_2) \left\{ -2 X_{i2}^s \left( X_{i2}^s \right)^2 \gamma_2 + (P_2 - \gamma_2 - P_{i2}) X_{i2}^r \right\}.
\]

Given the assumption of profit-maximization, the second-order condition holds (i.e., \( CC < 0 \)).

With linear supply and demand curves, \( CC \) must be negative: With \( X_{i2}^s = X_{i2}^d = X_{i2}^r = 0 \),

\[
CC = \left[ 2 X_{i2}^s (t_2 - t_1) + C_1^r (X_{i2}^s)^2 (t_1 - I) + \gamma_2^r (X_{i2}^s)^2 (t_2 - I) \right]. \quad \text{With increasing marginal costs (i.e., } \gamma_2^r > 0, C^r > 0), 0 < t_1 < 1, \ 0 < t_2 < 1 \text{ and } t_1 < t_2 \ (t_1 > t_2) \text{ when the MNC operates along the } X_{i2}^d \text{ (} X_{i2}^s \text{) curve, } CC < 0 \).

**Tax Conditions:** When operating along division 1’s supply curve, top management’s first-order condition is
\[
\frac{-X_{12}}{(P_2 - \gamma_2 - P_{12})X_{12} - X_{12}} = \frac{(1-t_2)}{(1-t_1)}. \tag{A5}
\]

Given \(0 < t_1 < 1\) and \(0 < t_2 < 1\), \(\frac{(1-t_2)}{(1-t_1)} > 0\), which means \(\frac{(P_2 - \gamma_2 - P_{12})X_{12} - X_{12}}{X_{12}} < 0\). We also know \((P_2 - \gamma_2 - P_{12}) > 0\) and \(X_{12} > 0\) when the MNC operates along the supply curve, which means \(\frac{(P_2 - \gamma_2 - P_{12})X_{12}'}{X_{12}} < |X_{12}|\). Therefore, \(\frac{(1-t_2)}{(1-t_1)} > 1\), and \(t_1 > t_2\). When the MNC operates along division 2’s demand curve, top management’s first-order condition is

\[
\frac{-\left[(P_{12} - C_i')X_{12} + X_{12}\right]}{-X_{12}} = \frac{(1-t_2)}{(1-t_1)}. \tag{A6}
\]

We know \(\frac{(1-t_2)}{(1-t_1)} > 0\), which means \(\left[(P_{12} - C_i')X_{12} + X_{12}\right] > 0\). We also know \((P_{12} - C_i') > 0\) and \(X_{12} < 0\) when the MNC operates along the demand curve, which means \(\left[(P_{12} - C_i')X_{12}'\right] < |X_{12}|\).

Therefore, \(\frac{(1-t_2)}{(1-t_1)} < 1\), and \(t_1 < t_2\).

**Appendix B: Bonuses and Taxable Income:** The joint gain in division after-tax profit is

\[
\Pi_{\text{MNC}}^\text{RG} = \left[\left(1-t_1\right)\Pi_i^C + (1-t_2)\Pi_2^C\right] - \left[\left(1-t_1\right)\Pi_i^{\text{NC}} + (1-t_2)\Pi_2^{\text{NC}}\right], \tag{B1}
\]

where \(\left\{(1-t_1)\Pi_i^C + (1-t_2)\Pi_2^C\right\} = \Pi_{\text{MNC}}^\text{CAT}\) (C is cooperative; CAT is cooperative after-tax) and

\(\left\{(1-t_1)\Pi_i^{\text{NC}} + (1-t_2)\Pi_2^{\text{NC}}\right\} = \Pi_{\text{MNC}}^\text{NCAT}\) (NC is non-cooperative; NCAT is non-cooperative after-tax). The cooperative solution is \(P_{12}^{\text{Neg}} = P_{12}^{\text{UB}}\) or \(P_{12}^{\text{LB}}\), and \(X_{12}^{\text{Neg}} = X_{12}^0\). The non-cooperative solution is \(P_{12}^{\text{LB}} \leq P_{12}^{\text{CTP}} \leq P_{12}^{\text{UB}}\), \(P_{12}^{\text{CTP}} \neq P_{12}^0\), and \(X_{12}^{\text{CTP}} < X_{12}^0\). Top management calculates division management bonuses, without discrimination, using the same function \(f\). 

40
\[ B_1 = f\left( \Pi_1^{PE} \right) \text{ and } B_2 = f\left( \Pi_2^{PE} \right). \]  \hfill (B2)

\( \Pi_1^{PE} \) and \( \Pi_2^{PE} \) are performance evaluation profits, which equal
\[ \Pi_1^{PE} = \left\{ (1-t_i)\Pi_1^{NC} + \gamma\Pi_{MNC}^{BG} \right\} \text{ and } \Pi_2^{PE} = \left\{ (1-t_2)\Pi_2^{NC} + \left(1-\gamma\right)\Pi_{MNC}^{BG} \right\}. \]  \hfill (B3)

\( \gamma \) (1 − \( \gamma \)) equals division 1’s (division 2’s) negotiated share of the joint gain (0 ≤ \( \gamma \) ≤ 1), and \( \Pi_1^{NC} \) and \( \Pi_2^{NC} \) equal the non-cooperative before-tax and before-bonus profits. Division managers communicate to top management the negotiated allocation of the joint gain, \( \gamma \), which top management enters into its management compensation software to calculate bonuses. Division management bonuses, \( B_1 \) and \( B_2 \), do not feedback to cause an adjustment to \( \Pi_1^{C} \), \( \Pi_1^{NC} \), \( \Pi_1^{NC} \), or \( \Pi_2^{NC} \), which are fixed at the end of the accounting period. Therefore, performance evaluation profits, \( \Pi_1^{PE} \) and \( \Pi_2^{PE} \), are also fixed at the end of the accounting period, once the negotiated profit split, \( \gamma \), is determined and fixed through negotiation. Top management calculates division before-tax (i.e., taxable) profits for its financial statements and income tax returns as follows:
\[ \Pi_1^{CFin} = \Pi_1^{C} - B_1 \text{ and } \Pi_2^{CFin} = \Pi_2^{C} - B_2. \]  \hfill (B4)

Division managements’ base salaries already appear in operating expenses that are used to calculate \( \Pi_1^{C} \), \( \Pi_1^{NC} \), \( \Pi_1^{NC} \), and \( \Pi_2^{NC} \). The MNC’s after-tax financial profit is
\[ \Pi_{MNC}^{CFin} = (1-t_1)\left[ \Pi_1^{C} - B_1 \right] + (1-t_2)\left[ \Pi_2^{C} - B_2 \right]. \]  \hfill (B5)

### Footnote
32 \( \Pi_i^{NCFIN} = \Pi_i^{NC} - B_i \), \( \Pi_2^{NCFIN} = \Pi_2^{NC} - B_2 \), and \( \Pi_{MNC}^{NCFIN} = (1-t_1)\left[ \Pi_1^{NC} - B_1 \right] + (1-t_2)\left[ \Pi_2^{NC} - B_2 \right]. \)
Figure 1: Hirshleifer (1956, 1964)

Figure 2: Transfer Pricing for Intangibles