THE ECONOMICS OF TRANSFER PRICING: LOOKING BACK, THINKING FORWARD

LORRAINE EDEN

Forthcoming in THE ECONOMICS OF TRANSFER PRICING (Edward Elgar, 2019)

I. KEY CONCEPTS

Economists have devoted many years to understanding why and how firms set their transfer prices, and when and how they engage in transfer price manipulation. In this volume, I bring together 50 of the most significant pieces that have been published on this topic from 1955 to the present, a span of more than 60 years. My purpose in this chapter is to look back, exploring the evolution of the field over time, highlighting the contributions made by individual scholars, and showing how new research "stands on the shoulders" of the scholarly work that was done by earlier scholars.

Section I of this chapter provides an introduction to the key concepts in the field of transfer pricing. Section II provides an overview of the extant literature on the economics of transfer pricing, highlighting the contributions made by the 50 key articles included in this research collection. I have organized the articles into four categories: the early work on decentralization and transfer pricing, government regulation and transfer pricing, market characteristics and transfer price, and empirical estimates of transfer price manipulation. Section III illustrates the main research strands on transfer pricing through the lens of my own work in this area. Using confidential transactions-level data on US merchandise trade flows, I illustrate how government regulation and market characteristics can induce manipulation of transfer prices. Section IV provides a look forward at potential areas for new research on the economics of transfer pricing.

Transfer pricing and intrafirm trade

Transfer pricing is the setting of prices for transactions between or among commonly controlled subunits of a multi-unit organization. The multi-unit organization is normally modeled by economists as a multi-divisional profit-maximizing firm, but transfer pricing issues arise in all multi-unit entities including hospitals, universities, government agencies and not-for-profit organizations.

Transactions among commonly controlled subunits are referred to in the economics literature as *intrafirm, related party or non-arm's length transactions*. Economists typically model these transactions as merchandise trade (i.e., trade in parts, unfinished or finished goods). However, intrafirm trade can take place in many forms including raw materials, intangibles, services and capital flows; examples include the pricing of crude oil and natural gas, licenses for patents and brand names, computer technician services, and loans and guarantees. Related party transactions are also typically modeled as bilateral (between a single buyer and seller), but can also be multilateral (e.g., where several subunits engage in R&D cost sharing or one subunit provides shared services to the group).

By far the most attention in the economics literature has been paid to multi-unit, profit-maximizing firms that have subunits that engage in value-adding activities located in different countries, which are called *multinational enterprises (MNEs).* MNE subunits (also referred to as affiliates) include the parent firm and its domestic and foreign branches and subsidiaries. The largest MNEs now have extensive global production networks where each subunit typically performs one activity/task (e.g., assembly, marketing, distribution or sales) and then engages in related-party transactions with other MNE subunits. Where one subunit sells a product downstream to another subunit for further processing, the transaction is referred to as *vertically integrated trade* among the related parties. *Horizontally integrated trade* between related parties occurs when two or more subunits engage in trade at the same stage of the value chain, for example, where trade occurs in differentiated products or one subunit transfers its excess supply to another subunit.

MNEs now best envisaged as complex networks that are at the same time both vertically integrated (i.e., different stages of production or activities or tasks along the value chain are done inhouse) and horizontally integrated (i.e., multiple subunits, particularly those close to the final customer, are engaged in the same activity/task). UNCTAD (2013, p. 135) has estimated that now about 80 percent of worldwide gross exports are linked to the international production networks of MNEs because of the multiple times that intermediate goods are imported, processed and exported, in repeat cycles, along the MNE's global value chain.

The best estimates of related-party merchandise trade at the country level come from the United States. The US Census Bureau (2017, p.1) reported that in 2016, related-party trade was 42.2 percent of total US trade in goods; i.e., $1,537.4 billion of $3,624.6 billion. The share of related-party trade in total goods trade has also been relatively constant, rising slowly over the period 2008-2016, from 39.8 percent in 2008 to 42.2 percent in 2016. Moreover, the related-party share in 2016 was higher for US goods imports for consumption (49.3 percent) than for US goods exports (32.1 percent); this gap has persisted also for several years. In addition, there is strong evidence that the share of related party trade in total US trade varies widely by commodity group, industry and country (Feenstra and Shiells, 1997; Zeile, 1997, US Census Bureau, 2016; World Bank, 2017, pp.59-69), suggesting that transfer pricing could have uneven impacts across commodities, industries and bilateral trade balances.

Internal and external motivations for transfer pricing

Transfer pricing is a critical issue for multi-unit organizations because these internal prices can affect resource allocation, investment decisions and profit sharing within the group of commonly controlled entities. There is a large literature in managerial and cost accounting, for example, which explores internal motivations for setting transfer prices such as goal congruence between subunits and headquarters, preference revelation, and rewarding subunit managers. While economists have also looked at internal motivations for transfer pricing; most of the theoretical and empirical work in economics has focused on external motivations for transfer pricing such as how MNEs respond to customs duties, exchange controls or differences in corporate income tax rates.

Here it is helpful to distinguish transfer pricing from *transfer price manipulation (TPM).* The two concepts are different although often confused by the media and the general public. Transfer price manipulation is the strategic setting by the MNE of transfer prices above or below opportunity cost to avoid or evade government controls and/or to arbitrage differences in government regulations across countries (Horst, 1971; Eden, 1998).

TPM (sometimes referred to as transfer mispricing or abusive transfer pricing) has been highly

controversial for many decades because transfer prices affect where MNE profits are declared and taxes are paid. TPM has therefore been a long-run concern of government policy makers, especially national tax authorities (Eden, 1998, 2009, 2012, 2016). MNEs, by engaging in TPM, can achieve a higher after-tax global profit than can two non-related firms. TPM can lower the firm's cost of capital and/or create a greater return from cash flow by reducing the MNE's worldwide regulatory burden (Harris, Morck, Slemrod and Yeung, 1993). Income shifting through TPM can improve the MNE's financial performance, allowing the firm to achieve higher rents on its intangible assets. TPM therefore can create an additional benefit to the MNE from internalizing markets over and above reduction of transaction costs.

Because world markets are incompletely integrated, firms can add value through cross-border operations that exploit incomplete integration (a.k.a. semiglobalization). Ghemawat (2003) theorized that firms can add value through cross-border operations under incomplete integration in one of two ways: arbitrage (exploiting differences across countries) and integration (exploiting similarities across countries). Horizontally integrated MNEs tend to emphasize integration (economies of scale and scope), whereas vertically integrated MNEs emphasize arbitrage (differences in factor costs and product demands). MNEs that are both vertically and horizontally integrated – as are most of today's MNEs with their global production networks – therefore need to simultaneously take advantage of both arbitrage and integration opportunities.

TPM has therefore been seen by economists as a potentially value-adding response to the arbitrage opportunities created by semiglobalized markets. Rugman and Eden (1985) argued, for example, that government regulations could be viewed as exogenous non-market imperfections and that TPM could be a welfare-enhancing way to arbitrage these government-imposed imperfections.

Note that TPM is typically about arbitrage (exploiting differences in policies and markets across countries) but can also be about exploiting cross-border integration economies (e.g., economies of scale and scope). Therefore, building on Ghemawat (2003), TPM should provide value to the cross-border operations of multinationals, particularly for large MNEs that can take advantage of multiple markets and multiple borders. The flexibility to transfer resources, using internal transactions, effectively and

efficiently through a global network is a primary advantage that MNEs have over domestic firms (Kogut and Kulatilaka 1994). Internal transactions "allow the MNE to exercise its 'multinationality'", compensate for the costs of operating abroad, and achieve competitive advantage" (Cravens, 1997, p.129).

Internalization theorists argue that MNEs exercise their multinationality by choosing internal instead of arm's length transactions when transaction costs are high due to missing or imperfect markets (Buckley and Casson, 1976). Buckley and Casson, for example, argued that internalization was likely in four cases of market failure (missing futures markets, bilateral monopoly, buyer uncertainty, and restrictions on price discrimination) and in a fifth case where differences in government regulations offered arbitrage opportunities. Thus, TPM, which takes advantage of arbitrage opportunities, could be a motivation for internalization. Arguing that TPM was a "problem of considerable concern to host governments" (pp. 108-109), the authors hypothesized that the MNE's ability to engage in TPM depended on (p. 44):

> [the] ability to minimize the impact of government interventions through transfer pricing; the exploitation of transfer pricing depends not only on the *nature of the product* and the *structure of the external market*, but also on the *characteristics of the fiscal systems* in the various regions linked by the market. (italics added)

Most economists who study transfer pricing have focused on the latter half of this quote; that is, the link between characteristics of fiscal systems (e.g., tariffs and taxes) and TPM; a few economists have studied the linkages between product characteristics, market structure and TPM. In short, *to understand why MNEs manipulate transfer prices and their impacts on MNE sales, output, trade and profits, we need to examine the roles played by both governments and markets.*

II. THE TOP FIFTY

Criteria for selecting the pieces included in this collection

As in any collection of "best works" on a particular subject, there were multiple factors that affected which pieces were included and which excluded from this collection. Some of the factors that were

important in my decision-making are briefly outlined here.

First, the theme of this book is the "economics of transfer pricing." I therefore limited works to those that were written by economists and published in scholarly economics journals and outlets. A major implication of this decision was to exclude a number of articles published in accounting journals (with one exception) on the grounds that the accounting literature on transfer pricing is large and worthy of a "best works" edited collection in its own right. A second major implication was to exclude works published in professional transfer pricing journals. While there are seminal pieces published in, for example, *Tax Management Transfer Pricing Report* and *Tax Notes International*, they deserve a separate collection also.

Second, I selected pieces that together would provide an overview of the field and how it has evolved. Some subjects have been exhaustively discussed (e.g., taxes, tariffs and transfer pricing); while others have received little attention (e.g., transfer pricing of natural resources). I wanted to include pieces in this collection that represented key themes in the field. Some articles in a well-explored area were therefore left out in order to provide room for other topics.

Third, I looked carefully at citation counts for the pieces that passed my initial screening criteria, with the caveat that I know citation counts are only a rough metric for assessing quality and contribution to the field. Moreover, book chapters have only been recently indexed electronically so their citation counts tend to be lower than for journal articles. I also gathered and compared lists and reviews by other scholars on the "best pieces" written on transfer pricing. These sources helped determine which were included and which excluded. For example, I often dropped journal articles that had no or very few citations.

Fourth were a set of pragmatic reasons. Costs and book length were of course important to Edward Elgar, which is publishing this collection. Some pieces were outrageously priced by publishers who owned the copyright, so those pieces are not included here. One piece I wanted to include was declined by the authors since it was only available through NBER and they planned to revise and submit to a scholarly journal. Edward Elgar encouraged me also to include several of my own works, which I have

done. Lastly, I have my own personal favorites and views on which papers have been foundational pieces on the economics of transfer prices, so this collection represents my personal tastes and judgements also.

Once I had a full set of articles, I arranged them first by topic, and then chronologically within each topic. I read the set through, identified problems (e.g., missing pieces, repetitive pieces), revised the collection, and then finalized the set, which you have here. A *mea culpa*: Some of the works could have been placed in two or more of my groupings; I selected what to me was the most appropriate placement. I have also grouped my literature review of the 50 works according to a mixture of chronology and content.

I hope that you find this collection valuable for expanding and deepening your own knowledge of the economics of transfer pricing. To assist in your reading, the rest of this chapter provides an overview of the collection, first, by summarizing the main contributions of the 50 works, and second, through a new piece of my own on the economics of transfer pricing that brings together and builds on many themes explored by earlier researchers.

The early work: Divisionalized transfer pricing

Since transfer pricing is the setting of prices for transactions between or among commonly controlled subunits of a multi-unit organization, it is not surprising that the early work in this area focused on pricing problems arising from dividing a single-unit firm into decentralized departments or divisions. Decentralization was expected to increase the firm's profitability, but breaking the firm into subunits, possibly in different locations, raised the issue of flows between the subunits and whether and how they should be priced. While microeconomists looked at this question primarily through the lens of centralized (fiat) versus decentralized pricing (see, for example, Arrow (1960)), business economists saw that decentralized firms were setting up their subunits either as cost centers or profit centers and choosing transfer pricing methods based on the organizational form of the subunit. The latter approach has been an essential building block in the economic theory of transfer pricing, and where I start my review.

In one of the earliest pieces on this topic, **Cook (1955)** asks whether giving the subunits of a firm their autonomy might lead them to focus on their own profits at the expense of the profitability of the firm

as a whole. Cook broke this question into two parts: (i) whether the subunit should buy or sell on an external market, if an external market existed, and (ii) whether intrafirm transfers should be at cost (with or without a markup) or based on market prices. His answer was that if a well-developed outside market existed and the subunits were set up as autonomous profit centers, the subunits should be encouraged to buy or sell on the open market at market prices, and that doing so would maximize profitability of the firm as a whole. This statement came with several caveats. First, the net prices for buyers and sellers might differ for a variety of reasons ranging from transportation costs to the gains from integration. Second, market prices might result in one subunit running at a loss so that whether to shut down the subunit became a second consideration. Third, if the selling subunit had excess capacity, its opportunity cost was not the market price, but marginal cost.

Cook (1955) went on to outline a variety of problems that would be faced by other forms of pricing systems such as cost plus or cost-plus return on investment. He also raised the issue of whether transfer prices should be set by the parent firm ("top down") or negotiated through hard bargaining among the subunits ("bottom up"). Since Cook's article, the questions he raised have been explored in much greater depth by cost and management accounting scholars. I have not included key works from this literature in this book, as the research questions have preoccupied business scholars much more so than economists, but the interested reader is directed to Borkowski (1996) and Gox and Schiller (2007).

Hirshleifer's two articles (**Hirshleifer, 1956, 1957**) build directly on Cook (1955) and another piece not included in this compendium (Dean, 1955). Hirshleifer (1956) is, in my view, the more important of the two pieces, and the one that I require my students to read. He starts with what has become the classic way to model transfer pricing, which is the pricing of a finished good traded between two divisions, a manufacturer (M) and a distributor (D), of a vertically integrated firm. Using graphs of demand and supply curves, for overall profit maximization, he shows that the summed marginal costs, MC(M) + MC(D), should equal marginal revenue from final sales by the distributor, MR(D).

The question is the pricing of the intrafirm traded product; that is, should the transfer price equal the marginal cost of the manufacturer, MC(M), or some other price? Hirshleifer first shows that the correct

transfer price is the marginal cost of the exporting division, MC(M), which represents the opportunity cost of intrafirm trade. Like Cook, Hirshleifer goes on to argue that if a well-functioning external market exists and the two subunits are autonomous, the efficient transfer price is not marginal cost, but the external market price. Even though one subunit suffers a fall in its profits, the gain to the firm as a whole is greater; thus, Pareto efficiency requires that the transfer price be the market price. In my own work, I call this result "Hirshleifer's Rule" (Eden, 1998).

Hirshleifer shows, however, that this result does not hold where there is interdependence between the subunits, either on the supply side (e.g., technological interdependence arising from economies of scale and scope or joint inputs) or the demand side (e.g., joint or complementary outputs or tied sales). The result also does not hold if the external market either does not exist (e.g., for unique or "crown jewel" intangibles), is too thin, or is not perfectly competitive. In these cases, the efficient transfer price is not the market price but something else, typically a price that involves comparing the firm's total costs and revenues.

The second article, Hirshleifer (1957), carries the analysis two steps further by exploring how demand and supply interdependence in the form of joint costs and joint products affect the efficient transfer price. He models the firm now as having three subunits: a manufacturer and two distributors. He uses a 2x2 matrix to explore supply interdependence, depending on whether costs are fixed or variable and separate or common. He also considers joint production and the possibility of plant closures. The points made are similar; that is, interdependence breaks the Hirshleifer Rule. The efficient transfer price is not the external market price, but rather "something else."

The last paper in this section, by **Gould (1964),** models a decentralized firm with two subunits, mining and processing, when they face differing costs to using the outside market. Typically, transaction costs of buying are higher than costs of selling on an external market. Gould finds the efficient solution depends on whether the marginal cost of the mining subunit is higher, lower or in between the external market prices for the two subunits. He argues that differences in minimum efficient scale (MES) between the two subunits can generate these cases. For example, one mine may produce enough raw material to

supply several downstream processing plants. The greater MES of the upstream plant suggests it will regularly have excess capacity to sell on the open market. In such cases, Gould argues the transfer price should be the external market price facing the selling division. Where MES of the downstream subunit were larger, the reverse would be the case: the efficient transfer price should be the external market price facing the buying subunit.

From the advantage of 60 years later, we know that demand and supply interdependencies are the norm, not the exception, for multinational enterprises. Also, external markets are typically thin, poorly developed or missing in many developing and emerging market economies. Thus, using market-based prices as the best method for setting prices for related party transactions means that we are using a second-best solution to the problems raised by Cook, Hirshleifer and others so many years ago.

Governments and transfer pricing

The articles discussed above ignore government policies and focus solely on internal motivations for transfer pricing arising from decentralization of the firm into subunits. However, economists studying transfer pricing have been fascinated with motivations for transfer pricing that arise from outside the firm (i.e., external motivations). Most, but not all of this literature, has looked at different types of government policies as motivations for manipulation of transfer prices by MNEs that have subunits (affiliates) in different countries. Government regulation is assumed to be exogeneous and the MNE reacts by changing transfer prices and intrafirm trade flows, which has additional effects on output and employment, sales and the balance of payments.

In addition, many economists have studied the interactions between MNEs and governments; that is, how MNE-state bargaining can affect government policies and MNE responses. Government regulation becomes endogenous and can have quite different impacts. I examine both below.

Government regulation

I start with **Horst (1971)**, which has been foundational for so many transfer pricing studies. In his

model, the decentralized firm is an MNE with two affiliates in different countries. Both affiliates produce the same product and are monopolists in their local market; there is no external market. Each affiliate maximizes its profits by setting its marginal revenue equal to its marginal cost (MRi = MCi for 1=1,2).

Horst does not spell out the mechanisms, but I believe understanding the underlying mechanisms is important for building the model and its extensions so let me explain them here. I think of the MNE as a multi-product, multi-market firm with monopoly power in its markets. Conceptualizing of the MNE in this way implies that incentives for intrafirm trade between the affiliates will be generated whenever there are differences in their marginal costs (MC1 ≠ MC) and/or marginal revenues (MR1 ≠ MR2). The simplest way to explain this is to explore each of the terms in my definition of the MNE, as follows:

- A multi-plant firm will minimize its total costs by allocating production across its production plants up to the point where their marginal costs are equal; that is, MCi is the same for all plants.
- A multi-market firm will maximize its total revenues by allocating sales across its markets up to the point where their marginal revenues are equal; that is MRi is the same for all markets.
- A profit-maximizing firm will maximize its profits by setting its marginal revenue equal to marginal cost (MRi = MCi).

Putting these three conditions together, if the MNE consists of two plants i=1,2 selling in two markets j=1,2, the three profit-maximizing conditions are:

- Multi-plant: MC1=MC2
- Multi-market: MR1=MR2
- Monopoly: MR1=MC1 for i=1,2

These three conditions together imply that the MNE as a whole should maximize its joint profits by equating marginal costs across all of its plants with marginal revenues across all of its markets; that is, MR1=MR2=MC1=MC2. However, it is highly unlikely that all plants will have the technologies or cost functions, or all markets the same revenue-generating potentials. Some locations will be lower cost locations than others; some markets will be higher revenue generating than others. Thus, trade between

the affiliates emerges when the MNE realizes that it can take advantage of differences across its plants in their costs and across its markets in their revenue generation. Intrafirm trade generates gains for the MNE that are similar to the gains from international trade from standard international trade theory. The gains arise from specialization (taking advantage of differences in production costs across locations) and exchange (taking advantage of differences in revenue generation across markets).

The affiliate with the lower MR=MC equilibrium when intrafirm trade is zero between the affiliates becomes the exporter; the affiliate with the higher MR=MC at the no-trade equilibrium is the importer. Intrafirm trade is generated up to the point where all three conditions are satisfied simultaneously, that is, where all arbitrage opportunities have been exploited at MR1 = MC1 = MR2 = MC2. That point also defines the efficient transfer price (the shadow price) for the MNE, which is the marginal cost of the exporting affiliate, the same price that Hirshleifer (1957) identified as the efficient transfer price for multi-divisional firms when there was no external market.

Note that both affiliates can gain from intrafirm trade. As long as the transfer price is above the MR=MC equilibrium under no trade for the exporting affiliate, it is better off. Similarly, as long as the transfer price is below the no-trade MR=MC equilibrium for the importing affiliate, it is better off. Their gains may not be the same size (nothing guarantees a 50-50 split); all that is expected is that both affiliates can share in the gains generated from intrafirm trade.

We can now go back to Horst (1971), who asks the following question: How do tariffs and profit taxes affect the volume and pricing of intrafirm trade? He argues that *ad valorem* tariffs, because they are based on the import price, can be reduced by dropping the transfer price. Underinvoicing lowers the per-unit tariff costs.

Taxes on profits, such as corporate income taxes, however, have more complicated effects. Assume affiliate 1 is the exporter and affiliate 2 the importer. Now assume that the government of country 1 where firm 1 is located decided to put a profit tax on profits declared in country 1. From a pre-tax viewpoint, for efficient resource allocation, the MNE should set the transfer price equal to MC1, the marginal cost of the exporting affiliate. However, from a post-tax viewpoint, the MNE will have higher overall after-tax

profits if it shifts the location where profits are declared for tax purposes from the high-tax to the low-tax country. By underinvoicing exports (outbound transfers) from affiliate 1 to affiliate 2, the location where profits are declared is from country 1 to country 2. Assuming the tax rate is 20 percent, for every dollar that the MNE underinvoices its exports, the MNE saves 20 cents in tax. Higher profit taxes levied on the exporting affiliate therefore have a similar effect to an ad valorem tariff levied by the importing country; both encourage underinvoicing exports from affiliate 1 to affiliate 2.

If the profit tax had been levied instead by the importing country on firm 2's profits, the situation would have been the reverse. The MNE has an incentive to use overinvoicing of its exports to firm 2 as a way to shift profits to affiliate 1 where they would not be taxed. In this situation, the two policies of government 2 are in conflict: the tariff encourages underinvoicing whereas the profit tax encourages overinvoicing.

Horst (1971) looks at the case where both governments tax affiliate profits and the importing government also levies a tariff. The MNE must now compare the effects of both the tax rates and the tariff on its overall after-tax profitability. In some cases, the net effect will be to induce overpricing; in others, underpricing of related party trade. The results also depend on whether the MNE can price discriminate between the two markets; i.e., on the extent of monopoly power that the MNE has in both markets.

Itagaki (1979) builds on Horst's model of a horizontally integrated MNE by exploring the impacts of transfer pricing on government revenues and the balance of payments. He also looks at how devaluation of a currency can affect the MNE's transfer price.

Copithorne (1971) covers much the same ground as Horst (1971) but instead of horizontally integrated trade, he uses Hirshleifer's (1957) model of vertically integrated trade. The three-affiliate model consists of one upstream firm (the manufacturer and exporter) and two downstream firms (secondary processers or distributors). Copithorne explores how profit taxes, tariffs and sales taxes can affect the profit-maximizing transfer price. He also discussed briefly the situation where a host-country government requires the MNE to have a foreign partner as a condition for establishment. He argues that forced sharing of equity ownership gives the MNE an incentive to shift profits away from the joint

venture to other affiliates that are wholly owned by the MNE.

The model of a vertically integrated MNE developed in Hirshleifer (1971) and Copithorne (1977) became a building block for other economists. **Booth and Jensen (1977)**, for example, use the model to examine two complications. The first is where governments require minimum levels of profits to be declared in each country; in such cases the transfer price becomes bounded. The second is where tax rates vary with the level of profits, further complicating the determination of the optimal transfer price.

Eden (1978) complicates the model with two tariffs, one on primary imports and another on secondary (downstream) imports. She also examines situations with both primary and secondary tariffs and profit taxes levied by one or both countries. She looks at both source and residence rules for taxing MNE profits, how they vary depending on whether the affiliates are branches or subsidiaries, and the form of foreign tax credit relief offered by the home country.

Another trade policy discussed in this literature is **Katrak (1981)**, who examines the optimal combination, from the viewpoint of the host country, of a profit tax and an export tax (or subsidy) levied by a host government on a foreign subsidiary. He shows that, contrary to the standard trade theory result that a small country cannot gain from levying an export tax (since it is too small to affect world prices), when the tax is levied on exports of a foreign subsidiary, the host country's welfare may rise as it captures some of the foreign profits that would otherwise leave the country.

Kant (1990) builds on Katrak (1981) to explore the optimal regulatory policy of a host country government when the foreign subsidiary is less than wholly owned. He also introduces a new form of tax: a penalty tax that is levied by the host government whenever there is a divergence between the transfer price set by the MNE and the regulated transfer price.

Bond (1980) was perhaps the first to recognize that the MNE's selection of a transfer price could be viewed as trading off, at the margin, two competing goals: efficient resource allocation and reducing tax payments. In a decentralized MNE, he argued that transfer prices had to be used for both resource allocation and determining tax payments; whereas a centralized MNE could keep two sets of books with one set of prices for internal allocation and another set for tax reporting. As a result, transfer pricing in

decentralized firms must trade off the gains from tax avoidance against the efficiency losses from resource misallocation.

Diewert (1985) confirms Bond's (1980) insight that the MNE trades off at the margin the tax-saving gains against the efficiency losses from misallocating resources, using an elegant model of an MNE with two affiliates, one seller and one buyer. He starts by defining five types of transfer prices:

- efficient transfer price: the opportunity cost (shadow price) of intrafirm trade.
- money or profit-maximizing transfer price: the price that achieves the highest possible after-tax profits for the MNE, given that the transfer price must be acceptable to government regulators.
- decentralized transfer price: the price set by the MNE parent to be used by the two subunits to allocate resources; these prices may differ for the buying and selling subunits.
- arm's-length transfer price: the price negotiated through hard bargaining between the decentralized subunits.
- regulated transfer price: the transfer price set by the government regulator.

Diewert (1985) then explores the welfare implications of these different types of transfer prices when governments levy both tariffs and profit taxes on the MNE affiliates. He argues that the gains to the MNE from tax avoidance (which are revenue losses to governments) come at the expense of misallocated resources. As a result, the deadweight losses due to international tax differentials are worsened when MNEs engage in transfer price manipulation. Thus, the existence of trade taxes and differences in corporate income taxes are external motivations that induce MNEs to engage in transfer price manipulation and inefficient resource allocation, lowering world welfare.

In all of these models, the profit-maximizing transfer price is assumed not to be affected by the marginal decisions of the affiliates; that is, the transfer price is exogenous. **Samuelson (1982)** was the first to examine endogenous transfer prices whereby MNEs recognize that setting their output and sales levels can also affect the upper and lower boundaries on the transfer price. In such cases, depending on whether the goal is a high or a low transfer price, the MNE should take these second-round marginal

effects into consideration.

Endogenous transfer prices are also explored in **Eden (1983)**, which examines how different types of tariffs (primary versus secondary tariffs) and different GATT customs valuation methods (transaction value, resale value and computed value) can affect transfer prices and intrafirm trade flows. She argues that tariff policy has three goals (reducing imports, raising revenues and protecting domestic industry) and that achievement of these goals varies depending on the type of tariff and customs valuation method.

Lastly, **Kant (1988)** builds on the Horst (1971) model but relaxes the assumption that the government's policy is known. He assumes that as the MNE moves its transfer price toward the tax minimizing boundary, the probability of the government levying a penalty on the MNE increases. As a result, the MNE constrains its transfer pricing boundaries so as to reduce the likelihood of a penalty.

Eden (1985) pulls together all of this literature into one paper, exploring both the Horst (1971) model of a horizontally integrated MNE and the Copithorne (1971) model of a vertically integrated MNE. She considers both primary and secondary tariffs and various forms of profit taxes levied by the home and host governments. She models endogenous transfer prices, exchange rates, and optimal commercial policies. Eden also addresses the question of whether manipulating transfer prices improves or worsens economic efficiency in a world of taxes and tariffs. She finds that results are ambiguous; in some cases, the profit-maximizing transfer price is more efficient than the shadow transfer price (the marginal cost of exports); in other situations, the reverse is the case.

Eden (1998) provides another overview of the microeconomics of transfer pricing. She reviews the standard model of tariffs and pure profit taxes and includes cases where the MNE can (or cannot) keep two sets of transfer prices (two sets of books), minority joint venture partners, and uncertain exchange rates. A new contribution is to shift from modeling taxes on pure profits to more sophisticated modeling of corporate income and withholding taxes. Her model takes into account the cost of capital, investment rates, dividend remittance policies, head office fees, and foreign tax credits. A second contribution of the chapter is a detailed modeling of transfer pricing penalties, based on the US inaccuracy penalty regulations (Internal Revenue Code Section 6662). A third contribution is the modeling of global unitary

taxation (formulary apportionment)

Schjelderup and Weichenrieder (1999) use the two-subunit (buyer-seller) model of the MNE to ask how the model's results would change if governments decided to regulate transfer prices not by comparing the MNE's transfer prices with arm's length prices but rather by comparing the MNE's profits to profits earned by comparable uncontrolled firms. The inspiration for their model is the addition in 1994 of the comparable profits method (CPM) to the IRS Section 482 transfer pricing regulations. The CPM determines the arm's length transfer price by comparing an affiliate's profitability with the profits earned by comparable unrelated firms under the same or similar facts and circumstances. The authors find that regulation by profits requires less information to implement than price regulation but has more negative impacts on intrafirm trade.

The last paper in this section, **Keuschnigg and Devereux (2013)**, assumes a representative MNE parents firm that assembles a final good in a high tax country ("the North") and offshores production of intermediate inputs to an arm's length supplier and/or a foreign affiliate in a low tax country ("the South"). There are financing frictions in the South which make it hard to raise funds locally. A vertically integrated firm therefore has an advantage over an arm's length firm because the parent can use TPM to shift funds to its foreign affiliate. As a result, forcing the MNE to use an arm' length transfer pricing policy based on market prices charged by unrelated suppliers is not efficient; the authors argue that the optimal transfer price should take into account the distortion in capital markets.

Bargaining models

Most transfer pricing models start with a single MNE and a single (typically the host country) government where the government sets the regulation and the MNE responds. However, one stream of literature has focused on bargaining not only on dyadic bargains between the MNE and the government, but also other forms of bargaining such as between two governments. Since TPM affects where subunit profits are declared, both home and host government revenues can be affected. In addition, the MNE may face local rival firms so that bargaining between firms is also possible. It is therefore not surprising that

economists have investigated various forms of action and reaction including MNEs and nation states.

One of the first papers along these lines was **Svejnar and Smith (1984)** who modeled three parties: a joint venture with two partners (a foreign MNE and a domestic firm) and the host government. The authors model both bilateral bargaining between the partners and then bargaining among the three parties. The authors also consider the case where the local partner is a state owned enterprise. The government's goals are generating of tax revenues and/or employment. The authors find that the profit split between the joint venture partners depends on their bargaining power, which affects their ability to engage in TPM, not on their percentage of equity ownership.

Prusa (1990) models a vertically integrated MNE where the parent firm makes an intermediate good that is processed and sold by a foreign affiliate. The parent firm knows its true costs, but the host government does not. The value of the MNE's private information – the information asymmetry – has a shadow price, which the government (the principal) must pay to induce truth telling by the MNE (the agent).

Gresik and Nelson (1994) extend Prusa (1990) to consider the case where the host government can regulate the transfer price both directly and also indirectly through fiscal regulations (a combination of tariff, profit taxes, profit remittances and subsidy). Gresik and Nelson find that the principal-agent model under uncertainty can generate quite different results from the standard model. For example, the optimal transfer price is unlikely to be the marginal cost of the exporting firm, and the profit-maximizing transfer price may not be either the upper or lower boundary price, contrary to Copithorne (1971), Diewert (1985) and Eden (1985).

The model becomes more complicated in **Elitzur and Mintz (1996)**, who use the principal-agent framework where the parent firm (the principal) must provide an incentive to its downstream affiliate (the agent) to induce the affiliate to align its goals with the parent's. The home and host governments are assumed to engage in a non-cooperative game in setting their tax rates so as to maximize their own national tax revenues. Tax competition in the presence of transfer pricing causes one government to lower its rate in response to a rate increase by the other government. Harmonization of taxes by the two

governments leads to lower effective corporate tax rates in both countries.

Raimondos-Moller and Scharf (2002) extend Elitzur and Mintz (1996) by assuming first that the home and host governments compete over the optimal transfer price rule for given tax rates, and then consider harmonization of transfer pricing rules. The authors find that competition over transfer pricing rules can lead to a 'race to the top.'

Haufler and Schjelderup (2000) model non-cooperative bargaining between home and host governments where the governments can set both the tax rate and the tax base but faces a fixed revenue constraint. In the absence of cross-border profit shifting through capital movements (foreign direct investment) or transfer price manipulation, efficiency requires full deduction for the cost of capital (cash flow taxation). In the presence of cross-border profit shifting, however, this result no longer holds. Governments should distort capital flows in order to lower tax rates and reduce the incentives for TPM.

Peralta, Wauthy and van Ypersele (2006) extend Raimondos-Moller and Scharf (2002) to examine the case where the two governments compete over both the profit tax rate and how rigorously they enforce national transfer pricing rules. They argue that if one government sets a tight monitoring policy over transfer prices, the MNE cannot engage in income shifting in that location and is therefore more likely to establish operations in the other location. A loose monitoring policy on the other hand encourages firm location in that country and income shifting via TPM to the low tax location.

The international tax system used today is referred to as a "separate accounting" system because MNE subsidiaries are treated as separate entities that stand alone from their parent firms for tax purposes. Governments levy profit taxes on these entities up to the "water's edge", that is, to national borders. Because transfer pricing affects where profits are declared, governments have set up transfer pricing rules based on the arm's length principle to ensure that where MNE subunits declare profits is consistent with what independent entities would have done under the same facts and circumstances. An alternative system, formulary apportionment, allocates MNE subunit profits among countries according to a formula, typically based on a weighted combination of sales, capital and labor. For a more detailed description see Eden (1998). **Kind, Midelfart and Schjelderup (2005)** examine tax competition between governments

when taxes are based either on separate accounting or on formulary apportionment. Their model has two MNEs, each with two subunits, where the parent firms are headquartered in different countries. The two governments tax both their domestic firm and the foreign firm. Decision making is modelled as a three-stage, non-cooperative game where the governments compete over tax rates at the first stage, the parent firms compete over transfer prices at the second stage, and the two foreign affiliates compete over output at the third stage. The authors find that welfare is higher under separate accounting if trade costs are large, but formulary apportionment is preferred when trade taxes are low. The choice of international tax system is therefore dependent on the level of economic integration between the countries.

Markets and transfer pricing

I have argued above that both governments and markets can provide motivations for firms to engage in transfer price manipulation. In this section, I turn now to markets, reviewing several key readings on how market distortions and product characteristics can affect transfer pricing.

Market distortions

In this section on transfer pricing and market distortions, I have included four journal articles, two that explore exchange rate uncertainty, and two that explore imperfectly competitive markets.

Batra and Hadar (1979) add exchange rate uncertainty to Horst's (1971) model of a horizontally integrated MNE, looking at both fixed and flexible exchange rates. For fixed exchange rates, they find that home country devaluation leads to increased intrafirm exports (as predicted for arm's length trade), but not necessarily increased total sales. A second finding is that under flexible exchange rates with a forward market, MNEs only partly hedge their FX exposure, choosing to retain the ability to engage in speculative trades.

Exchange rate uncertainty is also analyzed by **Itagaki (1981).** He models a two-subunit MNE where the parent and affiliate each make a different part (e.g., rubber blade and metal frame) and both make the same final good (e.g., assembling a windshield wiper). Intrafirm trade takes place in both parts and the final good. MNE profits are taxed in both countries, following the residence-source principles where tax

deferral is permissible. He finds that exchange rate uncertainty affects the relative profitability of the two locations, causing the MNE to change its intermediate and final good intrafirm trade flows. The results are complex, however, so Itagaki simplifies the model by assume intrafirm trade only in the final good. He then looks at two cases (home currency devaluation and forward cover) and shows how they affect the MNE's trade, sales and outputs.

Turning now to imperfectly competitive markets, **Schjelderup and Sorgard (1997)** make two changes to the horizontally integrated MNE model in Horst (1971). First, they argue that many decentralized MNEs set transfer prices at headquarters, but delegate decision making over output and sales to subunits. The authors therefore model transfer pricing as a two-stage process with the parent setting the transfer price and final prices to consumers, output and sales being determined at the local level. Second, the Horst model assumes the subunits have monopoly power in their local market, whereas the authors assume the subunits must compete with local rivals. Schjelderup and Sorgard examine two types of strategic interaction: Cournot (competing over quantity) competition and Bertrand competition (competing over price). The authors conclude that both the nature of competition and the way that foreign profits are taxed affect the MNE's transfer pricing policy. Under Bertrand (Cournot) competition, more aggressive behavior by the affiliate triggers more (less) aggressive price behavior by the local rival.

Zhao (2000) builds on the Copithorne model of a vertically integrated MNE. Zhao assumes two-stage decision-making where the parent firm sets the transfer price and the foreign affiliate determines the level of output. He also assumes that the foreign affiliate faces a local rival firm; a key difference is that the local rival can be one of three types: fully integrated (it makes both the input and the final product), the rival makes only the input and sells it to the affiliate, or the rival makes only the final product and buys the input from the affiliate. Zhao assumes a Nash bargaining model determines the equilibrium output, sales and prices. He finds that the vertically integrated MNE does manipulate the transfer price so as to compete with the foreign rival.

Product characteristics: intangibles and non-renewable resources

In this section, I include three articles on transfer pricing of intangible assets and one on non-

renewable resources.

Kopits (1976) was one of the first economists to explore transfer price manipulation in the form of over/under invoicing of intrafirm royalty payments and license fees. He modeled royalty payments as an initial lump sum payment plus a percentage of net sales of the final product embodying the intangible. The host government levied a higher withholding tax on royalties than on dividends, but royalties had an advantage for the MNE since they were tax-deductible costs and could be used to shift profits out of the host country. Since both forms of withholding tax were creditable against the home country tax, Kopits argued that the MNE would pay out both dividends and royalties, using royalties to absorb any excess foreign tax credits generated by dividends. He argued that since intangibles were inherently difficult to price, it would be easier for MNEs to use payments for intangibles as a profit-shifting method.

Although Kopits (1976) is not cited in **Grubert (2003)**, the article is a nice follow-on piece. Grubert argues that R&D intensive MNEs are more likely to locate in low-tax jurisdictions and use intrafirm trade and transfer price manipulation, especially of intangible assets, to reduce their world-wide tax payments. He found that subsidiaries with R&D-intensive US parents had greater volumes of intrafirm trade and more opportunities for TPM; in addition, the foreign affiliates were more likely to be located in jurisdictions with either very low or very high tax rates. MNEs used income shifting through TPM to reduce the negative impact of high-tax jurisdictions while magnifying the attraction of low-tax jurisdiction.

Dischinger and Riedel (2011) also address the migration of intangible assets to low-tax affiliates within the MNE group. Using ORBIS data on foreign affiliates with European parents, the authors look first at factors causing MNEs to shift intangible assets to foreign affiliates (either by shifting asset ownership or distorting royalty payments), and second whether corporate tax levels affect the extent of the shifted assets, finding strong evidence of both effects.

Transfer pricing of non-renewable resources focuses on a very different product characteristic: resources that have finite lives. **Samuelson (1986)** models a two-affiliate MNE where each produces a different final good (e.g., gasoline and kerosene) from a common exhaustible resource (e.g., petroleum);

intrafirm trade takes place in the resource. He assumes the typical combination of profit taxes and a tariff. Optimal extraction of an exhaustible resource, which requires that the marginal profit from resource use must grow at the rate of interest, provides an arm's length boundary for the transfer price. However, marginal extraction cost does not set a natural lower boundary, unlike in Horst (1971) and Copithorne (1971), because resource prices often bear little relation to extraction costs. Samuelson concludes that the exhaustibility is an important product characteristic for transfer pricing.

Empirical estimates of transfer price manipulation

Up until now, I have primarily reviewed papers that were theoretical in nature, building hypotheses about how government policies and market characteristics could affect how MNEs set their transfer prices. Reviews of this literature can be found elsewhere also; see, for example, Caves (1996), Eden (1998) and UNCTAD (2000a, b)).

The empirical literature on transfer pricing manipulation, on the other hand, is thinner and more mixed. Empirical work in this area can be decompartmentalized into two basic types. First, there are studies that use either foreign direct investment (FDI) flows or profit-based measures to test whether MNEs shift income to locations with lower corporate income tax (CIT) rates; these are referred to as *income shifting* studies. The second type of study has *directly* searched for evidence of TPM by comparing intrafirm prices to market prices. The early studies in this group typically compared prices of selected imports to world or domestic prices for the same products. The more recent work has been to test for TPM on large, transaction-level datasets that include both arm's length and intrafirm international transactions. Such datasets are rare. Below I review the key works in both areas: income shifting and trade mispricing. See also Eden (1998, 2012) for earlier reviews.

Income shifting estimates

An early paper to analyze motivations for income shifting was **Stewart (1986)**, who uses Horst's (1971) two-subunit model of a horizontally integrated MNE. Stewart assumes the foreign subsidiary is mature, that is, the affiliate regularly returns some percent of its profits to the parent firm even though tax

deferral would permit all foreign profits to be held offshore. The article explores a wide variety of ways that the MNE can shift income from the foreign subsidiary to the parent firm: dividends, charges for intrafirm services (i.e., head office charges, interest on intracorporate debt, R&D allocations, royalties charged for the parent's intangible assets) and "standard" TPM (over/under invoicing the traded good). Foreign withholding taxes vary with the form of profit repatriation and are creditable along with the foreign corporate income tax (CIT) in the home country up to the home country CIT rate. Stewart examines cases where the MNE has either a surplus or deficit of foreign tax credits. A key extension is to examine not only the comparative statics short term solution, but also the MNE's longer term investment strategy. Maximizing global after-tax profits requires the MNE to balance at the margin the after-tax rate of return on foreign retained earnings to the after-tax rate of return on the parent's domestic equity. This alters both the optimal debt-equity ratio and the allocation of capital between the parent and its foreign affiliate. A second key insight is that the different forms of profit repatriation can be ranked when the MNE has a surplus of foreign tax credits. Stewart shows that the MNE should repatriate profits via "traditional" TPM (underinvoicing affiliate exports to its parent) first and then by paying high head-office charges (since they incur withholding taxes) up to where the foreign tax credits are exhausted.

Grubert and Mutti (1991) provides a nice empirical test of income shifting theory using data on US MNEs in 1982. A key insight is that statutory CIT rates should affect optimal transfer prices, whereas marginal effective CIT rates should affect optimal investment decisions; the authors find support for this conjecture. They also find that reported profits of foreign affiliates of US multinationals are consistent with income shifting behaviors.

Grubert and Mutti (1991) is extended in **Jacob (1996)** to examine the impacts of the drop in the US statutory CIT rate from 46 percent to 34 percent in 1986. Jacob argued that the drop in CIT should encourage MNEs to shift income into and deductions out of the United States. He found that before 1986 MNEs with relatively larger volumes of related party transactions paid less tax; whereas after 1986, the reverse occurred, which was consistent with an income-shifting response to the tax change. Moreover, Jacob found that MNEs with relatively high related party transactions showed lower global tax payments

both before and after the tax rate change, providing additional confirmation of income shifting via TPM.

Azemar and Corcos (2009) investigate the impact of the foreign affiliate ownership structure (wholly owned versus joint ventures) and R&D intensity (a high versus low R&D-to-sales ratio) on the tax sensitivity of MNE capital investments in foreign subsidiaries. The authors hypothesize that MNEs engaged in TPM would try to maintain standard profit-to-asset ratios in order to reduce the likelihood of detection and punishment by foreign tax authorities. This article is unusual in that it uses the Toyo Keizai database of Japanese MNEs with foreign affiliates rather than a US MNEs dataset to test for income shifting. Azemar and Corcos find that investments by Japanese MNEs were more sensitive to CIT rates in emerging economies when their foreign affiliates were wholly owned by R&D-intensive parent firms, and argued this finding was indirect evidence of TPM.

Taxes on capital can generate less than expected revenues not only when MNEs engage in income shifting through TPM and debt-equity changes, but also when the capital stock falls in response to the tax. **Bartelsman and Beetsma (2003)**, using a dataset for 22 OECD countries for 1979-1997, examine the impact of both mechanisms – nominal (TPM and debt/equity changes) and real (capital and capital/labor flows) --- on relatively rich and large economies. Their estimates are based on value added changes at the sectoral and national levels. The authors find substantial evidence of cross-border income shifting among OECD countries; estimating that one country's unilateral tax increase would generate 65 percent less revenues than expected due to income shifting.

An indirect approach to income shifting estimates of transfer price manipulation is conducted by **Eden, Juarez Valdez and Li (2005).** The authors examine how the introduction of the US transfer pricing penalty (Internal Revenue Code Section 6662) affected the US and Japanese stock market valuations of Japanese multinationals with US affiliates during the 1990s. Event study methodology is used to estimate cumulative abnormal returns (CARs) for key dates in the US policy making process. Then, pooled cross-section time-series regressions and subgroup analyses are used to identify key factors affecting the stock market returns. The authors find that the penalty had a significant, negative impact on the CARs of Japanese MNEs listed on the US stock market, particularly for the early events. The negative

impacts on CARs were smaller for non-automotive and electronics MNEs because these firms had been publicly targeted as tax avoiders by the US Congress (CARs capture surprise).

Transfer mispricing estimates

Economists have also tested for TPM using datasets that include both arm's length and intrafirm international transactions. One of the earliest works to provide an overview of how transfer prices would respond to a wide variety of government policies was **Lall (1973).** In addition to listing and exploring the forms of government regulations that could induce TPM, Lall also examined internal and external limits on trade mispricing, reviewed the state of the literature on empirical tests of TPM, and offered recommendations for future research on TPM.

Datasets that include identifiers for related party trade are rare. **Benvignati (1985)** was perhaps the first economist to use a large secondary dataset to examine transfer mispricing. The US Federal Trade Commission required US MNEs to report annual financial data by line of business for 1974-1977, including identifiers for related party transactions and the type of transfer pricing method (market price, cost, cost plus a markup or other). She found that foreign transfers were more frequently priced on a non-market basis than domestic transfers. She also found that US tariffs were less important than CIT rates and firm characteristics in explaining transfer prices for foreign transfers.

Another US dataset with identifiers for related party transactions was generated by the US Petroleum Industry Program, which collected statistics on US monthly cross-border transactions in crude petroleum from 1973 to 1984. **Bernard and Weiner (1990)** is based on this dataset. Using sophisticated regression analysis techniques, they find very weak evidence of TPM in US and Canadian import prices, which could have been partly related to CIT differentials. While this "top 50" compendium does not include the follow-up pieces, interested readers are referred also to Bernard and Weiner (1992, 1996) and to the debate between Rugman (1985) and Bernard and Genest-Laplante (2006) over whether there was TPM in Canadian oil import prices in the 1970s and early 1980s.

Transaction data on US exports and imports are collected by the US Census Bureau, and the data do have a marker for related party transactions as recorded by the freight forwarder. As discussed in Eden

(2001), this marker has not been verified or cleaned by the US Census and is often missing. Still, economists have used the US Census dataset with good effect. For example, **Swenson (2001)** examines US annual merchandise trade with five countries in products identified at the six-digit HS level to test for evidence of TPM over 1981-88. She constructs price data by dividing each product's annual dollar value of trade by its trade volume, for each year and country. Swenson finds that a five percent fall in foreign CIT rates caused a small rise in US import prices. Swenson did not separate related party from non-related party transactions in the Census dataset, so her estimates are of trade mispricing in general, not of TPM.

Ferrantino, Lui and Wang (2012) is a very interesting study that examined US merchandise imports from China for 2002-2008, using transaction-level data from the two statistical agencies, US Census and China Customs, to examine the flows from both directions. The authors' work is motivated by the puzzle that reported US imports from China are larger than China's reported exports to the United States. The authors hypothesize that Chinese firms would engage in trade mispricing to avoid China's value added tax and capital controls and US customs duties. Their dataset is limited to direct exports (e.g., Shanghai to Los Angeles) to avoid the confounding problem of transactions routed through Hong Kong. They use the marker for related and unrelated party transactions in the US Census dataset. A key assumption is that the firms can report different transaction prices to the two agencies, whereas most transfer pricing studies assume there is one reported price. The impact of allowing different prices reported to different agencies is that the authors can decouple and separately examine trade misreporting (which applies to all trade, whether between related or unrelated firms) from TPM (which applies only to related party trade). The authors find that "trade misreporting is a more general phenomenon than transfer pricing" (Ferrantino et al., 2012: 147) and that both types of traders have an incentive to misreport prices, in particular to avoid the Chinese value added tax at the border.

The US Bureau of Labor Statistics (BLS) uses US Census data to construct indices of US export and import prices. As part of its program, the BLS does identify and clean the data for transactions involving MNEs. The BLS codes whether the MNEs transactions were between related or unrelated firms, and for

related party transactions, identifies the transfer pricing method (market price, cost based or other). The BLS dataset is therefore the first secondary (but confidential) database of export and import transactions for US and foreign MNEs that economists can use to test for evidence of TPM. For a detailed discussion of this database and its implications for US export and import price indexes see Eden (2001).

Clausing (2003) was perhaps the first published article to use the BLS dataset. She tests for links between corporate income tax differentials and TPM for US merchandise exports and imports over the 1997-1999 period. Clausing finds a strong relationship indicating tax avoidance: a "tax rate 1% lower in the country of destination/origin is associated with intrafirm export prices that are 1.8% lower and intrafirm import prices that are 2.0 % higher, relative to non-intrafirm goods" (p. 16).[1]

Eden and Rodriguez (2004) also use the BLS dataset for US imports to assess the impact of intrafirm trade on international price indexes, arguing that TPM should widen the gap between unit value indexes and price specification indexes. Their empirical work shows that a 10 percent increase in the intrafirm trade share of US imports widens the gap between the two indexes by 1.3 percent, with TPM strengthening the relationship. In Part III of this chapter, I also use data from the BLS dataset to investigate the impacts of governments and markets on MNE propensity to engage in TPM.

Lo, Wong and Firth (2010) also use a unique dataset, one generated by the Chinese government's decree that all firms listed on the Shanghai Stock Exchange in 2004 must disclose their gross profits on related party and unrelated party sales. Their research question asks whether good corporate governance could deter TPM by the MNE's managers. The authors argue that monitoring by the firm's board should deter opportunistic TPM. The authors confirm this hypothesis, finding that TPM was less egregious when firms had boards with a high percentage of independent directors, different individuals serving as the CEO and the chair of the board, and financial experts on their audit committees.

I conclude from my review that empirical evidence for TPM exists but is not overwhelming, and that most evidence has been by inference from income-shifting studies. The small number of empirical studies is perhaps not surprising given the fine-grained (individual transactions identified as related party or arm's length) and highly confidential nature of the data needed to test for TPM.

III. GOVERNMENTS, MARKETS AND TRANSFER PRICE MANIPULATION

Introduction

Above I have summarized the major strands of the economics literature on transfer pricing, arguing that the key research question that has preoccupied economists since the early 1970s has been the roles played by government policies (especially corporate income taxes) and market characteristics (especially market imperfections) in affecting transfer pricing and intrafirm trade. Transfer price manipulation is one of the key benefits of internalization because it enables MNEs to arbitrage differences in government regulation. At the same time, the MNE's ability to manipulate transfer prices depends on product characteristics and market structure. In this last section of the chapter, I draw together this literature to examine the effects of government policies and market characteristics as incentives for manipulating transfer prices. I focus first on the links between TPM and markets, and then between TPM and government policies.

My hypotheses are tested on a confidential dataset from the US Bureau of Labor Statistics (BLS) of 260,079 monthly US merchandise import transactions from 116 countries, for the period June 1998 to March 2000. The results provide strong support for the argument that both markets and governments affect the incentives to internalize markets and engage in TPM. The paper also provides evidence of how market structure and product characteristics can affect MNE aggressiveness in transfer pricing for US imports. Based on these results, I argue that transfer pricing is a dynamic capability (Teece, Pisano and Shuen, 1997) for MNEs, and that linking insights from the strategic management and transfer pricing literatures should provide a fruitful direction for new research.

Hypotheses development

Product characteristics, market structure and TPM

Markets are more likely to be internalized, and therefore to provide the opportunity for TPM, when they are characterized by natural monopoly, bilateral monopoly, buyer uncertainty, and public goods

characteristics (Buckley and Casson, 1976). I therefore hypothesize that three market factors provide opportunities or constraints on the MNE's ability and willingness to manipulate transfer prices. First, the type of markets where internalization is likely to occur are also markets where external market prices are unlikely to exist or difficult to find, which should encourage TPM. Second, certain product characteristics, such as knowledge intensity, are more likely to provide opportunities for TPM. Third, the degree of concentration in the market may provide an opportunity for big MNEs to exercise market power and engage in TPM.

External prices. The existence of external market prices, I hypothesize, is likely to discourage TPM, for three reasons. First, Hirshleifer (1956, 1957) was perhaps the first economist to suggest that MNEs would maximize global profits by setting the transfer price equal to the external market price, if the external price existed and if there were no interdependencies in demand or supply within the MNE network (see also, Diewert (1985), Eden (1998)). In the reverse situation (differentiated products lacking external market prices or in the presence of strong interdependencies), one would therefore expect more TPM. Second, to the extent that governments have access to external market prices for products comparable to the MNE's intrafirm transactions, the arm's length standard, which has been adopted by all OECD tax authorities, requires MNEs to use these external prices as transfer prices (Eden, Dacin and Wan, 2000). Both arguments suggest that if external prices exist, they are likely to be adopted by the MNE, which should discourage TPM.

Additional support for this view comes from Rauch's (1999) networks explanation for international trade patterns. He argued that homogeneous products were likely to have organized exchanges with posted prices that were well understood by buyers and sellers (e.g., the London Metal Exchange). The more differentiated the product, the less likely that external reference prices existed. As a result, search barriers to trade would be higher for differentiated than homogeneous products. Rauch proposed, and found empirical support for, the argument that geographic proximity and pre-existing cultural ties encouraged the formation of trading networks that affected international trade patterns.

Rangan (2000) has linked Rauch's theory to MNE networks, arguing that MNEs through

internalization could reduce the search and deliberation costs that characterized differentiated product markets. Markets with differentiated products and no reference prices should therefore be more likely dominated by intrafirm trade. Rangan also hypothesized that MNEs should have larger and faster responses to exogenous economic shocks than firms trading at arm's length. Using BEA data for 1977-94, he found that US MNEs in four industries (food, chemicals, machinery, electric) had greater and faster responses to exchange rate shocks than non-MNEs. A network view therefore suggests that internalization should be more prominent in markets without organized exchanges, and that MNEs should have greater opportunities for TPM.

H1: Transfer price manipulation should be more frequent where external markets do not have organized exchanges or reference prices, ceteris paribus.

Product characteristics. Buckley and Casson (1976, pp. 39-41) argued that there were certain markets that were highly likely to be internalized; e.g. knowledge, perishable agricultural products, capital-intensive manufacturing and geographically concentrated raw materials. The most likely were markets in knowledge because of such markets were typically plagued by natural monopoly, bilateral monopoly, buyer uncertainty, and public goods characteristics. In addition, because knowledge is difficult to value, it provides "an excellent basis for transfer pricing" (p. 40). Since MNEs cluster in knowledge-intensive manufacturing industries producing differentiated products (Caves, 1996), I argue that:

H2: The higher the knowledge-intensity of the product, the greater the incentive to engage in transfer price manipulation, ceteris paribus.

Firm size. Firm size can be seen from two perspectives: (1) how important the product is to the firm, and (2) how important the firm is to the market. From microeconomic theory, I know that the greater the importance of an input to a firm, the more elastic should be the firm's derived demand for that input, and thus the smaller the firm's price response in an arm's length market to any exogenous shock that shifts supply. Rangan (1998) has shown that MNEs respond more flexibly to exchange rate shocks than non-MNEs because they can shift production and sales among affiliates, as an alternative to price changes. This suggests that MNE price responses should be more elastic than those for non-MNEs; that is, as the

importance of the product to the firm rises, the price elasticity of import demand should be higher for intrafirm trade than for arm's length transactions. In addition, the fact that most intrafirm transactions are priced on a cost basis (Eden, 1998) suggests that a higher price elasticity (more stable prices) for intrafirm transactions than for arm's length trade.

H3a: The more important the product is to the firm, the greater the elasticity of import demand; price elasticity should be higher for intrafirm trade than arm's length transactions, ceteris paribus.

In terms of the importance of the firm to the market, microeconomics tells us that large firms are more likely to exert market power through manipulating prices than small firms; monopsony buyers, for example, should pay lower prices than in competitive markets. Buckley and Casson (1976) hypothesized that structural market imperfections such as bilateral monopoly and monopsony provided incentives to internalize markets, generating multinational enterprises. Since MNEs cluster in oligopolistic markets dominated by strong interfirm rivalry (Caves, 1996), relative firm size is likely to be an important predictor of price behavior. I therefore expect large MNEs to engage in discriminatory pricing behavior, but such opportunistic behavior should be more prevalent in arm's length transactions with rival firms rather than in intrafirm transactions with sister subsidiaries. This suggests that greater price variability should occur when large MNEs engage in arm's length trade compared to small MNEs.

On the other hand, manipulating prices in intrafirm transactions can be a joint reaction to opportunities for cross-border arbitrage. Large MNEs have more opportunities to engage in TPM with their affiliates than small MNEs because they trade in higher transaction volumes, with more frequency, across more country boundaries. Harris et al. (1993) provided empirical evidence that large MNEs engaged in more income-shifting behavior than small MNEs. Rangan (2000) hypothesized that large MNEs could more readily afford switching and search costs associated with frequent price changes, although he argued this was less likely in industries with large economies of scale. TPM in this case is not opportunistic behavior against one's trading partner, but rather taking joint advantage of opportunities for cross-border arbitrage in semiglobalized markets (Ghemawat, 2003).

I therefore expect that firm size should lead to greater price variability for MNEs, for both intrafirm

and arm's length transactions, although the motives in arm's length transactions (firm rivalry, opportunism) are different from those in intrafirm transactions (jointly pursuing opportunities such as cross-border arbitrage).

H3b: Firm size is positively related to TPM; that is, large MNEs are more likely than small MNEs to engage in TPM, ceteris paribus.

Government policies and TPM

Buckley and Casson (1976) argued that TPM was one of the key benefits of internalization because it enabled MNEs to avoid government regulations, specifically, taxes, tariffs and exchange controls (pp. 38, 108). I examine these three differences in fiscal systems and also a fourth general category: political risk. The arguments are well known so I only briefly review them here (see Eden, 1998, for a more thorough review).

Corporate income taxes. If there were no tax deferral or foreign source income were taxed as it was earned instead of when repatriated, the effective CIT rate on foreign source income would be the home country rate (assuming it were higher than the host rate). Then, there would be no advantage to TPM. However, most home governments allow tax deferral, which encourages MNEs to shift profits to lower taxed locations (Horst, 1971; Eden, 1985, 1998). Most governments also levy withholding taxes on intracorporate income that leaves the host country, ranging from 10 to 30 percent, to encourage MNEs to reinvest profits in the host country. Empirical tests show that withholding taxes affect the size, timing and type of repatriated income and discourage inward FDI (Hines, 1999). The key question is whether the host country's tax rate, including withholding taxes, exceeds or is less than the home tax rate.[2]

H4: If the corporate income tax rate in the exporting country is lower (higher) than in the importing country, the MNE should over (under) invoice intrafirm exports and under (over) invoice intrafirm imports to shift profits to the lower taxed location, ceteris paribus.

Ring fencing. Most countries offer tax incentives for inward FDI, ranging from locational subsidies to tax holidays for limited periods. Some governments set up tax-free zones for FDI, such as offshore financial centers and export processing zones. *Ring fencing* describes a preferential tax regime that is

limited to nonresidents or otherwise isolated from the domestic economy (OECD, 1998). Ring fencing means that the effective statutory CIT rate for the MNE subsidiary depends upon its activities since the maximum tax rate (the rate on non-preferred or onshore activities) could differ substantially from the minimum rate (the rate on preferred or offshore activities). The greater the difference, the more incentive the MNE has to shift its activities offshore.

H5: The greater the extent of ring fencing in a country, the greater the incentive to use transfer price manipulation to shift profits to the ring-fenced zone, ceteris paribus.

Double tax treaties. In 1997, there were 1,794 double tax treaties (DTTs) covering 178 countries; almost a 50 percent increase over 1990 levels (UNCTAD, 2000a, p.83). Current estimates as of 2018 are that there are now more than 3,000 bilateral tax treaties in existence. Bonigen and Davies (2000) find a positive relationship between DTTs and US bilateral FDI flows for 1966-1992. They conclude that DTTs "reduce investment frictions which inhibit FDI activity" (p. 7). Similarly, UNCTAD (2000a, p.81) states that tax treaties provide "stability, transparency and certainty of treatment".

Tax treaties require national tax authorities to adopt consistent transfer pricing regulations, following the arm's length standard[3], which should discourage TPM. Al-Eryani, Alam and Akhter (1990), for example, found that MNEs used market-based methods more intensively when they were concerned about legal requirements. DTTs also encourage exchange of tax information between governments, increasing the risks associated with TPM.

On the other hand, since both governments follow the arm's length standard, the probability of crossborder tax disputes should fall. If disputes occur, DTTs also include a bilateral dispute settlement mechanism. This mechanism also provides the MNE with protection against double taxation, using secondary adjustments.[4] In addition, home governments typically assume income earned in treaty-partner countries is active income, exempt from tax haven or passive income legislation that would deny them tax deferral benefits. The combination of a low CIT rate plus a DTT might therefore encourage more, not less, TPM.

This literature suggests that the incentive to manipulate transfer prices, in response to a double tax

treaty, could go either way, with one exception: where the foreign country is a low-tax location (particularly a tax haven with tax treaty status) I anticipate more, not less, TPM.

H6: The presence of a double tax treaty has confounding effects on transfer price manipulation, except when the foreign country is a low-tax location; in this case, I expect more income shifting through TPM, ceteris paribus.

Tariffs. Underinvoicing imports in order to avoid paying *ad valorem* tariffs is perhaps the best-known motivation for TPM. Horst (1971) was the first economist to recognize that MNEs should over/underinvoice depending on the comparison between the tariff rate (τ) and the tax differential ($t_m - t_x)/(1 - t_m$), where t_m is the importing country's CIT rate and t_x is the exporting country's CIT. Where the tax differential is higher (lower) than the tariff rate, MNE global after-tax profit is higher with overinvoicing (underinvoicing).

H7: Ad valorem tariffs encourage underinvoicing of intrafirm imports, ceteris paribus, but the effect is reduced if the foreign CIT rate is lower than the importing country's rate.

Political risk. Political risk involves "act[s] of government that have unfavorable consequences for the MNE" (Kobrin, 1979, pp.68-69). Lecraw (1985) found that perceived country risk caused MNEs to cut intrafirm export prices and raise import prices in ASEAN. Harris et al. (1993) found that presence in a high political risk country raised the US tax, indicating the shifting of income from these countries to MNE headquarters. I therefore hypothesize that:

H8: High levels of political risk should cause MNEs to under (over) underinvoice intrafirm exports (imports) in order to shift profits to safer locations, ceteris paribus.

Foreign exchange controls. Foreign exchange (FX) controls can motivate TPM (Buckley & Casson, 1976; Eden, 1998). Natke (1985) found that MNEs overinvoiced imports to avoid FX controls in Brazil. Lecraw (1985) found that MNEs reduced export prices and raised import prices in ASEAN countries with FX controls. FX exchange controls are usually one of two types: either the MNE affiliate is prohibited from or pays a tax on remitted profits to its parent, or the MNE must pay a higher rate for international currency transactions than local firms. In the first case, FX controls act like a profit tax,

encouraging TPM as a way to repatriate profits instead of through dividends (Vaitsos, 1974; Natke, 1985). In the second case, however, FX controls are a tax on crossborder transactions, encouraging underinvoicing. If each time a foreign affiliate engages in intrafirm transactions with its US parent, it pays a tax (the difference between the official and actual foreign exchange rate) to the host government, the incentive would be to underinvoice intrafirm exports so as to reduce the tax.

H9: If a host country imposes FX controls restricting profit remittances, the MNE should underinvoice outbound transactions and overinvoice inbound transactions as an alternative means of repatriating profits; however, if the government applies FX controls as a tax on all crossborder transactions, the MNE should underinvoice both in- and out-bound transactions, ceteris paribus.

Methodology

In summary, I argue that the ability to manipulate transfer prices is an internalization benefit for MNEs. TPM is a strategic response to arbitrage opportunities from incomplete integration (semiglobalization). These opportunities are of two types: differences in government policies and differences in product characteristics and industry structures. My model and hypotheses are outlined in Figure 1.

(Figure 1 goes about here)

My empirical tests of these hypotheses follow equation (1) below, where P_{ijkt} is the transaction price of product i imported by firm j from country k at time t.

$$P_{ijkt} = \alpha\,\text{CONTROLS} + \beta\,\text{IFT} + \theta\,\text{MARKET} + \phi\,\text{POLICY} + \gamma\,\text{IFT} * \text{MARKET} + \psi\,\text{IFT} * \text{POLICY} + \varepsilon \quad (1)$$

The specification in equation (1) implies that IFT (intrafirm trade dummy variable), MARKET (a vector of product characteristics and market structure variables) and POLICY (a vector of government policy variables) each directly affects the transaction price P_{ijkt} and that IFT moderates the relationship between POLICY, MARKET and P_{ijkt}. All variables except dummy variables are in natural log form. As a result,

the regression coefficients are elasticities, showing the responsiveness (percentage change) in the import price to a percentage change in the independent variables.

The BLS Import Price Dataset

The basic dataset used to test my hypotheses is a confidential monthly dataset of prices for US merchandise import transactions from the US Bureau of Labor Statistics, for the months between June 1998 and March 2000. Generally, the quality of trade data for imports is much better than for exports because more attention is paid by governments to valuing imports (i.e., trade taxes fall mostly on imports and rules of origin track imports). Therefore, using import rather than export data should improve the reliability of the results.

The data come from a voluntary survey of approximately 8,000 companies engaged in US trade (Alterman, Diewert & Feenstra, 1999; BLS, 1997). Each item (an import or export transaction by a firm) in the dataset has a unique identifier number. Items aggregate into classif groups that correspond to TSUSA product-level codes, and classif groups aggregate into three-digit SITC Revision 3 groups. Thus, items are nested in classif groups, which are nested in 3-digit SITC groups. Firms report actual import prices for the item, by month, identifying the country of export and whether the transaction was at arm's length or between related parties.[5] The dataset consists of 260,079 US import transactions for 116 foreign countries, involving 19,434 items, 3,652 companies and 2,942 classification codes.

Variables

Dependent variable. Because BLS price data are designed for measuring month-over-month changes in transaction prices, I use LNPX, the natural log of the import price P_{ijkt} of item i imported by company j from country k at time t, as the dependent variable.

Control variables. First, I need to control for pricing adjustments the BLS makes to the dataset. The Bureau takes quality adjustments and changes in product features into account through the creation of a link price to the transaction price, so I also include a dummy variable LINK (0=no link; 1=link). In addition, in any given month, 30 percent of BLS items do not have prices reported through surveys so the BLS imputes a price based on the average price movement of other transactions in the same classif group.

I use PXFLAG as a dummy variable for imputed prices (0=no imput, 1=imput).

Second, I include LNEXRATE, the natural log of US-dollar-equivalent exchange rate on a monthly basis; the data are from IMF (2001).[6] A rise in the foreign exchange rate should increase the US dollar price of exports from that country, unless the exporting firm is pricing to market in the United States. Clausing (2003) found that a rise in the US exchange rate (fall in foreign rates) caused both US export and import prices to fall, suggesting a positive relationship between LNEXRATE and LNPX.

The BLS also collects data on the invoicing currency used in a particular transaction. Almost 90 percent of US imports are invoiced in US dollars, the rest almost entirely in the exporter's home currency. Reflecting this, Mirus and Yeung (1987) found that the preferred currency in intrafirm transactions was the importer's currency, particularly when foreign exchange exposure was taken into account. To the extent that imports are invoiced in US prices, I should expect to see less price sensitivity to exchange rate movements. I include a dummy variable INVOICEUS (1=invoiced in US currency; 0=all others) to test this hypothesis.

Third, I control for transportation costs between countries. Feenstra's (1996) CD ROM reported FOB and CIF import prices by three-digit SITC Revision 3 (SITC R3). I calculated average insurance and freight rates as a percent of the CIF import price, by 3-digit SITC and by country and used 1 minus this variable, in log form (LNCIF), as a proxy for distance costs; that is LNCIF = ln(1 – d) where d is the cost of distance.[7] I expect that as distance costs rise, US import prices increase so the sign on LNCIF should be negative. In addition, I add dummy variables for the four largest US trading partners: Canada, Mexico, China and Japan (US Census, 2000). I also include dummy variables for the top five imported products in US trade flows at the 2-digit SITC level: apparel (84), motor vehicles (78), electrical machinery (77), office equipment (75) and telecommunications equipment (76).

Intrafirm trade. The BLS codes each transaction as either intrafirm or arm's length trade. I include IFT as a dummy variable (0 = arm's length trade or ALT; 1 = trade between related firms). IFT will be a key variable in the analysis.

Market variables. I have three hypotheses about the linkages between market structure and TPM.

H1 argues that TPM should be more likely in markets without organized exchanges or reference prices. Rauch (1999) coded product markets, using a five-digit SITC Revision 2 (SITC R2) classification, as 0 (organized exchange), 1 (reference prices) or 2(differentiated products). I develop a concordance between Rauch's scales and the BLS three-digit SITC R3 classification and generate the variable RAUCH, ranging from 0 to 2, to proxy for the increased probability that external market prices exist.[8] I expect the sign on RAUCH to be positive; that is, TPM should be more likely where product markets are differentiated.

Second, I hypothesize in H2 that TPM would be more likely for knowledge-intensive products. UNCTAD (2002) categorizes traded products, using the three-digit SITC Revision 2 classification, as one of five categories: (1) primary commodities, (2) labor- and resource-intensive manufactured goods, (3) low skill/technology manufactures, (4) medium skill/technology manufactures and (5) high skill/technology manufactures. I develop a concordance with the BLS data and group imports into one of three categories: primary products (group 1), low-medium tech manufactures (groups 2, 3 and 4), and high-tech manufactures (group 5). I drop primary products and include dummy variables MFGLMT (low-medium tech manufacturing) and MFGHT (high-tech manufacturing) to test whether knowledge-intensity is related to TPM.

Third, I hypothesize in H3a and H3b that firm size might affect TPM. The BLS data set includes several interesting measures of size. WTITEM is the dollar value of US imports of item i by firm j in classif group m from all countries in 1995 (the base year). WTITEM therefore is an absolute size measure of how much the firm imported of item i in classif m in the base period. WTCOMP is the 1995-dollar value of all imports in classif m by firm j (that is, WTCOMP is WTITEM summed over items in the same classif group). From these two numbers I create WTITCO, the ratio of WTITEM to WTCOMP, as a measure of the relative importance of item i to company j in classif group m. I use LNWTITEM (log of WTITEM) as a proxy for the absolute size, and LNWTITCO (log of WTITEM/WTCOMP), as a proxy for the relative size, of firm j within the market for item i. The greater the importance of item i to firm j, the more elastic should be the firm j's derived demand for item i, and thus, the smaller the price response

in an arm's length market to any exogenous shock. H3a hypothesizes that price elasticity should be higher for intrafirm than arm's length trade, as the importance of the product to the firm increases.

The third weight measure is WTCLASS, the 1995-dollar value of all US imports in classif m by all companies from all countries. (WTCLASS is WTCOMP summed over all firms importing products in classif m.) From WTCOMP and WTCLASS I create WTCOCLS, the ratio of WTCOMP to WTCLASS, which measures the relative importance of firm j as an importer in classif m.[9] The larger j's imports as a share of all imports of classif m, the greater should be j's monopsony bargaining power. One might expect that large buyers, in an arm's length situation, to exercise their monopsony power by demanding and obtaining lower import prices.[10] I hypothesize that large MNEs in comparison with small MNEs, in intrafirm transactions, should be more likely to use TPM to take advantage of cross-border arbitrage opportunities, as suggested by H3b.

Policy variables. I include three tax and three general policy variables in the empirical analysis. Annual tax rate data for 1998-2000 were hand collected from various accounting, legal and tax sources. First, I use LNTXMIN, the natural log of 1 minus the minimum statutory foreign corporate tax rate, $\ln(1 - t_x)$, where t_x is the exporting country's CIT rate. I expect MNEs to overinvoice US intrafirm imports from low tax countries so the sign on LNTXMIN should be positive, based on H4.

Second, I measured LNTXGAP, the extent of ring fencing in the foreign country by the gap between the minimum and maximum CIT rates, $\ln(t_x^{max} - t_x^{min})$, where the maximum rate also includes the withholding rate on repatriated dividends. Since I take the minimum CIT as the basic host CIT rate, the ring fencing variable measures the likelihood that the MNE will have to pay a foreign tax rate that is higher than the minimum rate. The greater that likelihood, the less should be the MNE's incentive to engage in TPM. I therefore expect the sign on LNTXGAP to be negative, based on H5.

The third tax variable is TREATY, a dummy variable identifying whether the foreign country has a double tax treaty with the United States (1=yes, 0=no). I constructed this variable from the US Treasury's website list of US tax treaties. I expect a DTT to discourage TPM, except where low-tax countries are involved, following H6.

The first general policy variable is the tariff rate by SITC and country. I computed these rates using Feenstra's (1996) CD ROM. The 1994 US import data reports customs duties and CIF import prices, by 3-digit SITC R3 code and country. These were used to create average tariff rates, by item and country; the LNTARIFF variable is in the form $\ln(1 - \tau)$ where τ is the tariff rate. I hypothesize in H7 that MNEs will underinvoice US imports so the sign on LNTARIFF should be positive.

Political risk may also create an incentive for MNEs to engage in TPM. The monthly composite risk rating from the International Country Risk Guide (ICRG) was used to construct LNPOLRSK, the natural log of the ICRG ratings (the data are reversed since ICRG gives a high rating to a low-risk country). I expect underinvoicing of US intrafirm imports from high-risk countries so LNPOLRSK should be negative, based on H8.

Lastly, FXCNTRL is a dummy variable identifying whether the foreign country imposes foreign exchange controls. I hand collected the data from various tax, accounting and legal sources. Because many countries have minimal FX controls, I created a three-level dummy variable (0=no controls, 1=minimal controls, 2=high controls). I expect MNEs to underinvoice US intrafirm imports to avoid FX controls when either the controls are on profit remittances or act a tax on all FX transactions. As a result, FXCNTRL should be negative for intrafirm transactions, following H9.

Regression methods

Because I have cross-section, time-series data with a large dummy-variable set, I use the AREG, ROBUST regression technique in STATA with White-corrected standard errors. AREG has an advantage in that it permits a categorical variable to be "absorbed" in the regressions as if it were specified by a series of dummy variables, without reporting the coefficients on the dummies. The absorbed variable is COMPANY, which creates a vector of 3,652 dummy variables, enabling us to control for the key variable influencing product price. In addition, AREG allows me to "cluster" a second variable where the observations are independent across groups, but not necessarily independent within groups. Because the observations are prices of particular items, I use ITEM (n=19,434) as a cluster variable. I also use 21 monthly time dummies to control for variation across time periods (dropping the first month). The impact

of clustering by item i with dummy variables for j – 1 firms is to create item-company pairs, recognizing that transactions are not independent because firms buy the same product repeatedly from the same suppliers in the same markets.[11] All regressions in the paper are clustered on ITEM and include dummy variables for COMPANY and MONTH.

Empirical results

Table 1 provides descriptive statistics for the variables. The pairwise correlations between LNPX and the independent variables are generally as hypothesized. The signs on IFT and the dummy variables for high-tech and differentiated products are positive; the signs on the weight variables are negative. The tax, political risk and exchange control measures have negative signs, whereas the signs on the treaty and tariff variables are positive. None of the correlations is high enough to suggest multicollinearity is a problem.

(Table 1 goes about here)

Overall relationships

I use moderated multiple regression and follow a hierarchical approach to testing equation (1). Table 2 summarizes the predicted signs from the hypotheses and shows the results of the moderated multiple regressions for LNPX.[12] First, I regress the dependent variable LNPX against the vector of CONTROL variables (column 1 in Table 2). The second set of equations adds the vector of MARKET variables (column 2M), the vector of POLICY variables (column 2P), and both sets of variables (column 2MP).[13] To test whether IFT moderates the relationship between LNPX, MARKET and POLICY, I introduce interaction terms between IFT and MARKET (column 3M), IFT and POLICY (column 3P), and IFT and both sets of variables (column 3MP). I adopt the conservative two-tailed t test for significance and report the change in F distribution as I add new variables along with the Chow test for the significance of the interaction terms.

The adjusted R squared ranges from .7306 to .7367 across the seven regressions in Table 1. A comparison of the change in F distribution statistics shows that adding in the Market and Policy variables

is a significant improvement over regression 1 (22.92 for the addition of the Market variables, and 5.81 for the Policy variables). The combination in equation 2MP is superior to either Market or Policy variables alone. In the third group of regressions, I add interaction effects with IFT. Again, there is significant improvement over the second set of regressions. The model therefore suggests that IFT is an important moderator of the relationship between US import prices, market structure and government policy variables. I also report Chow tests of significance for the interaction effects in the 3M, 3P and 3MP regressions, which demonstrate that IFT is an important moderator of the relationship between import prices and the independent variables.

(Table 2 goes about here)

Control variables. Across all seven regressions, LNEXRATE is consistently positive and significant, as expected. As foreign currencies appreciate relative to the US dollar, US import prices rise. At the same time, the coefficient on INVOICEUS is negative so that products invoiced in US dollars rise more slowly than products in other currencies, also as expected.

The sign on LNCIF, the distance measure, is positive in four cases, contrary to my prediction. An economic explanation for this anomaly suggests itself from international trade theory. Due to the large size of the US market, foreign exporters must price to market. Given a fixed US price, higher transport costs must be absorbed by the exporter, generating a lower FOB price. Since BLS prices are typically reported as FOB prices, higher transport costs would be reflected in lower FOB import prices.

In terms of product categories, apparel and electric prices are consistently negative relative to autos, office and telecommunications equipment. The country dummy variables show consistently lower price increases from Canada and China and higher price increases from Japan. Lastly, in four of the seven regressions, the IFT variable is positive, suggesting a general tendency for US import prices to rise faster for intrafirm trade than arm's length transactions, suggesting that MNEs are overinvoicing to shift income out of the United States.

Market variables. The coefficient on RAUCH is positive in the 2M and 2MP runs, suggesting that prices of differentiated imports have risen faster than prices of imports from markets with organized

exchanges or reference prices. When an interaction term with IFT is introduced (runs 3M and 3MP), the sign on RAUCH loses its significance, but the coefficient on IFT*RAUCH is strongly positive. This suggests that intrafirm imports are more likely to be overinvoiced when there are no external reference prices to act as comparables, providing support for H1.

The dummy variables for low-medium and high-tech manufactured products have positive signs in runs 2P and 2MP; that is, prices of high-tech imports have risen relative to primary imports over the 1998-2000 period. When these variables are interacted with IFT, the direct variables retain their significance, but the interaction terms are not significant in run 3M and negative in run 3MP. This suggests that either there is no difference between intrafirm and arm's length transactions (both prices tend to rise the greater the knowledge-intensity of the product) or that there is some tendency for transfer prices to rise more slowly than arm's length prices as knowledge-intensity increases.

Turning to the firm size variables, the sign on LNWTITEM is positive in all four runs, implying that the larger is the dollar value of firm j's initial purchases of item i from all countries, the greater the price increase over the time period. I give less credence, however, to the absolute measure as it may be an artifact of the way the BLS constructed the sample; the relative measure of firm weight should be a more accurate proxy variable. In terms of relative weight (LNWTITCO), however, the sign is the opposite: the more important item i is to firm j, the slower is the rise in prices. This accords with the microeconomic argument that the more important an input is in total cost, the higher should be its elasticity (that is, the smaller should be the price change for any given quantity change). The last weight measure is LNWTCOCLS, the importance of firm j in classif m, which is positive in all regressions, contrary to the expectation that larger buyers would exercise their monopsony power and generate lower price increases.

When the three weight variables are interacted with IFT, the interactions are all significant and the direct variables retain their significance and signs. Prices rise even more slowly for intrafirm transactions than for arm's length transactions, as LNWTITCO (the importance of the product to the firm) increases; this provides additional support for H3a. Prices also rise more slowly for IFT than ALT, as LNWTCOCLS (the importance of the firm in the classif group) increases. This suggests that MNEs are

either exerting monopsony power or that large MNEs are more likely to use cost-based transfer pricing methods, which rise more slowly than market-based prices. In either situation, I find support for H3b. I conclude that market structure is an important predictor of import prices (H3a), and that larger MNEs are more likely to engage in TPM than smaller MNEs, in accordance with H3b.

Policy variables. The signs on the government variables also provide strong support for my transfer pricing hypotheses. The two tax rate variables, LNTXMIN and LNTXGAP, both have the expected signs -- when the foreign rate is below the US rate, the incentive is to shift profits to the foreign country. When the tax variables are interacted with IFT in runs 3P and 3MP, the direct variables lose their significance, but the interaction terms are significant and in the direction predicted by H4 and H5.

The third tax variable, TREATY, is positive in all four regressions, which suggests a general tendency for higher import prices from countries that have tax treaties with the United States. The interaction with IFT is positive, suggesting that MNEs are more likely to overinvoice imports coming from tax treaty countries. Given the general bias towards overinvoicing reflected in the positive coefficient on IFT, I conclude that the presence of a tax treaty accentuates the incentive to manipulate transfer prices. I had hypothesized in H6 that tax treaties would have confounding effects on the incentive to manipulate prices; on the one hand, they provide more protection against aggressive tax authorities; on the other hand, they require MNEs to use the arm's length standard, which should constrain TPM. The empirical results suggest that the former effect outweighs the latter; that is, MNEs see tax treaties as providing security against aggressive governments (and the Internal Revenue Service was widely perceived to be the world's most aggressive tax authority during this time period).

Turning to the three general policy measures, I find that the tariff variable is not significant in any of the four runs. The interaction effect with IFT, however, is negative, implying that intrafirm transactions tend to be underinvoiced, relative to arm's length transactions, when tariffs exist, which provides support for H7.

The sign on LNPOLRSK is negative in all regressions, suggesting that import prices rise more slowly when they come from higher-risk countries. The interaction with IFT, however, is not significant,

contrary to H8. I had expected related parties to be more likely than arm's length parties to shift income out of high-risk locations; the data suggests both groups have similar income-shifting incentives.

Lastly, the sign on FXCNTRL is positive in all four regressions, suggesting that US import prices have risen faster from countries with exchange controls than from countries without controls. When the variable is interacted with IFT, the sign is negative, suggesting that intrafirm imports are more likely to be underinvoiced than arm's length imports when they come from countries with FX controls, which supports the income-shifting response found by earlier researchers. This results also fits with the argument that FX controls act as a tax. Both arguments provide support for H9.

Subgroup analysis

Interaction effects are useful to show the differing impacts of intrafirm versus arm's length trade on US import prices. Another way to parse out the differences is through subgroup analysis. Table 3 presents the results of several different subgroup tests, which were run using the variables in equation 2MP from Table 1. Plus (minus) signs indicate a positive (negative), significant coefficient at the 10% level using a two-tailed t test. I report the number of observations and the adjusted R squared and F test results. In addition, I tested for the change in F tests on four groups of independent variables: Product (M1 = RAUCH, MFGLMT, MFGHT), FIRM (M2 = LNWTITEM, LNWTITCO, LNWTCOCLS), Tax (P1 = LNTXMIN, LNTXGAP, TREATY) and General Policy (P2 = LNTARIFF, LNPOLRSK, FXCNTRL). These results are reported in the last four lines of Table 3.

(Table 3 goes about here)

Column 1 in Table 3 reports the results from the 2MP run in Table 2, for comparison. Columns 2 and 3 divide the data set into intrafirm trade (IFT) and arm's length trade (ALT). Clear differences emerge from this comparison. Prices of IFT transactions respond more – and in the hypothesized direction -- to exchange rate changes, the invoicing method, differentiated products, and the CIT rate differential between the US and the exporting country. The signs for FXCNTRL and LNTARIFF, however, for IFT are the opposite to that predicted (higher tariffs and exchange controls appear to encourage overinvoicing of IFT). In addition, prices of knowledge-intensive manufactured imports rise faster for ALT than for IFT.

The change in F statistics clearly show that IFT responses are larger than those for ALT; in fact, the change in F is not significant for the tax variables in the ALT regression.

In columns 4 and 5, I compare transactions by MNEs with transactions by non-MNEs.[14] Prices of MNE transactions respond more – and in the direction I predicted – to exchange rate changes, RAUCH, knowledge-intensive products, the CIT rate differential, and tax treaties. Non-MNE prices respond more negatively to political risk, and more positively to the relative weight of the firm within the classif group. In addition, the change in F statistics are much stronger for MNEs than for non-MNEs; in fact, for non-MNEs, the prices appear not to be responsive to the M1 (product characteristics) or P 1 (tax) variables.

Columns 6 and 7 report the results of dividing firms into two groups based on WTCOMP (the 1995-dollar imports in a particular classif code). Big firms appear to have larger price responses to the method of invoicing and differentiated products (RAUCH); whereas small firms have greater price responsiveness to ring fencing. Big firms exhibit greater change in F statistics than small firms; in particular, price responses by small firms appear not to be sensitive to the knowledge-intensity of imports.

Columns 8 and 9 test Rauch's (1999) hypothesis that price responses should be greater when organized exchanges and reference markets do not exist. What is perhaps most interesting about this subgroup analysis is that none of the four changes-in-F-statistic tests is significant for the Rauch OE and REF group whereas they are all highly significant for the Rauch DIF group. Clearly, prices of differentiated products respond more to market structure and government policy variables than do prices of products where there are organized exchanges or reference prices. Even within the knowledge-intensive group (RAUCH DIF), there is a positive, significant sign, suggesting that the higher the skill/technological intensity, the greater the price responsiveness. Prices of differentiated products are negatively affected by high foreign CIT rates, political risk and firm size (LNWTITCO), as hypothesized.

I next focus on comparing the three groups of imports, separated into high-tech manufacturing, low- and medium-tech manufacturing and primary imports. Again, I see the price responsiveness to government policies and market structure in the high-tech group but missing from the low-medium and primary commodity groups.

The last subgroup comparison takes all the intrafirm trade transactions – all the transfer pricing observations – and separates them into three groups. The first is a high-tax group, where the minimum foreign CIT rate is above the US statutory rate (35%). The second group is a low-tax group, where the maximum foreign CIT rate is below the US statutory rate. The third group (not reported) includes the remaining observations. The most interesting differences are three. First, the sign on LNTXGAP is positive for the high-tax IFT group. This means that even in high-tax countries where one would expect the MNE to engage in underinvoicing in order to shift profits to the United States, any ability to engage in ring fencing provides incentives for overinvoicing. Thus, tax preferences in OECD countries (e.g., Ireland) are likely to lead to overinvoicing of intrafirm exports to the United States.

Second, the sign on LNTARIFF is negative for low-tax IFT. I hypothesized that MNEs should engage in overinvoicing in order to shift income to low-tax locations. Overinvoicing, however, raises tariff costs. Thus, there is a tradeoff between the tariff and the CIT differential, as hypothesized by Horst (1971), when imports come from low-tax locations. This does not occur in high-tax locations where both the tariff and the CIT differential work to encourage underinvoicing of IFT. The sign on LNTARIFF in this subgroup analysis is, therefore, a nice confirmation of Horst's original proposition comparing the tariff to the tax differential.

Lastly, the sign on FXCNTRL is positive for high-tax, but insignificant for low-tax, locations. I hypothesized that underinvoicing of US intrafirm imports should occur in the presence of FX controls, and the interaction term in regressions 3P and 3MP in Table 2 both support this hypothesis. However, the subgroup analysis in Table 3 shows a positive sign on FXCNTRL in several MNE-related regressions, including column 14 (IFT & HIGH-TAX). Why foreign exchange controls appear to encourage overinvoicing of US imports in some situations and not others therefore appears to be a conundrum that needs further investigation.

Discussion and conclusions

I have grounded my theory development on the economics literature that argues MNEs use and benefit

from transfer price manipulation to arbitrage market imperfections and government regulations. My empirical results support this argument. Using monthly BLS transaction-level data for US merchandise imports, together with a large country-level database, I showed that both market imperfections and government regulations provide arbitrage opportunities for MNEs to engage in profitable TPM.

In terms of markets, the results support the hypothesis that TPM is more likely for US imports when organized exchanges and reference prices do not exist; that is, when products are differentiated. Second, TPM is more likely for knowledge-intensive products such as high-tech manufactured goods. Third, the more important the input is to the buyer, the greater is the import price elasticity for intrafirm transfers compared to arm's length transfers. And, lastly, size matters; large MNEs are more likely than small MNEs to engage in TPM.

In terms of governments, I find strong support for Horst's (1971) insight that tax differentials encourage TPM. Where foreign CIT rates are lower than US rates, the MNE underinvoices US imports in order to shift profits offshore, and the US tariff simply accentuates this underinvoicing. On the other hand, where foreign CIT rates are higher than US rates, the MNE is faced with a tradeoff: overinvoicing reduces overall tax payments but increases tariff costs. I also found that tax treaties provide security against aggressive tax authorities, and therefore encourage overinvoicing of US intrafirm imports. The political risk variable was negative and significant for all transactions, as expected, but the interaction terms with IFT were not significant in Table 2. In the subgroup analyses in Table 3, political risk appears to be an important negative influence on prices for arm's length transactions, non-MNEs, and for differentiated and knowledge-intensive products. Lastly, foreign exchange controls appear to encourage higher US import prices. While the negative interaction terms with IFT in Table 2 do suggest that MNEs underinvoice intrafirm transfers in order to shift profits out of countries with foreign exchange controls, the results from the subgroup analysis are more mixed.

IV. WHERE DO WE GO FROM HERE?

Given the clear, direct evidence that MNEs regularly engage in TPM in response to market

imperfections and government regulations, what are the implications for economists, and for management and international business scholars? What is the "next frontier" in transfer pricing research?

One possible direction for new research is to examine *integration motives* for TPM. Buckley and Casson (1976) argued that internalizing cross-border markets was more likely when there were market imperfections or differences in government regulations. In these situations manipulating transfer prices could be used by MNEs to arbitrage differences across countries in governments and markets. Ghemawat (2003), on the other hand, theorized that firms can add value through cross-border operations under incomplete integration not only through arbitrage (exploiting differences across countries) but also through integration (exploiting similarities across countries). Horizontally integrated MNEs tend to emphasize integration (economies of scale and scope), whereas vertically integrated MNEs emphasize arbitrage (differences in factor costs and product demands).

In this introductory chapter, most of the research that I have reviewed and my own work also have focused on the first of the two arguments: TPM is based on arbitrage, exploiting differences in policies and markets across countries). Economists, myself included, have paid less attention to integration motives for TPM. Some examples include cash pooling arrangements where the MNE sets up one subunit as the cash pool leader to handle financial transactions on behalf of the group. Shifting the ownership of the MNE's patent portfolio to a subunit located in a tax haven, which then charges the other affiliates in the MNE group for use of the patents is a second example. Cost sharing arrangements whereby the MNE parent and one or more of its subunits together develop intellectual property, which is then owned by the group, provides a third example. Marketing hubs that centralize the ownership of brand names and trademarks and provide marketing services to the affiliate group is a fourth example. A fifth example is the shared service center, whereby one subunit provides services (e.g., information technology, human resource services) to the group. Lastly, many MNEs have now set up subunits that engage in bulk purchasing on behalf of the group. A key characteristic of all of these examples except for the last one is that the activities involve intangible assets and/or services, not merchandise goods. Thus, the transactional dataset that we have used for our empirical work would not be useable here since the transaction data are

for merchandise (goods) transactions, not for intangibles or services. Still, there is a clear need for more theoretical – and empirical (should the datasets become available) -- research on the integration advantages of TPM, in addition to the existing work on the arbitrage advantages.

A second direction where more research on transfer pricing is needed is to build bridges between the work by economists on transfer pricing and the work by management scholars on MNE global strategies and dynamic capabilities. Since organizational and managerial processes are key to building the MNE's dynamic capabilities (Teece, Pisano and Shuen, 1997), I argue that *managing* transfer pricing decisions should be seen as a dynamic capability for the MNE. MNE managers with more expertise at managing intrafirm transactions and transfer pricing within the network should achieve better performance than MNEs without these managerial capabilities. Building on Teece, Pisano and Shuen (1997), I suggest three different capabilities are needed to develop an effective transfer pricing strategy: information gathering, balancing internal and external motivations for setting transfer prices, and handling agency problems in implementing a transfer pricing strategy across the MNE's network of affiliates worldwide. I conclude that linking the dynamic capabilities approach with the transfer pricing literature suggests a fruitful research direction for strategic management and international business scholars to pursue.

A third direction for new research is suggested by the current work at the OECD on the BEPS (Base Erosion and Profit Shifting) initiative, in particular, country by country reporting. As better data become available at the MNE subunit level, it should be possible for researchers to map and better understand the incentives driving the location of MNE global production networks. New work is going on now in terms of investment and offshore financial centers (UNCTAD, 2015, Chapter V) and investor nationality (UNCTAD, 2016, Chapter IV), for example. Linking this work on tax avoidance with transfer pricing is a useful direction for further research. I expect that arbitrage and integration incentives lie behind these decisions also.

Additional directions for future research on transfer pricing are suggested by the problems that are identifiable in my own study. My research suffers from several problems that may be improved by future scholars. First, the analysis is restricted to 22 months' of BLS pricing data for US imports. Adding more

recent time periods [15], and redoing the analysis for US exports should be (relatively) straightforward extensions. It is also possible to redo the analysis for particular countries (e.g., US-China and US-Japan trade could be particularly interesting) or industries (e.g., trade in automotive parts or steel). If it were possible (which, at present, it is not) to link the BLS's firm ID-code numbers with firm ID-code numbers from the US Bureau of Economic Analysis, the Internal Revenue Service's tax file code, and/or CUSIP numbers from Compustat, researchers would have much better measures of firm characteristics and resources (e.g., firm size, R&D intensity, international diversification, product diversification) than I do here. This would enable more sophisticated and robust testing of the ways in which firm characteristics and resources affect transfer pricing aggressiveness. Researchers could also test more directly the argument that strategic transfer pricing leads to improved firm performance.

ENDNOTES

[1] There are some problems with Clausing's (2003) analysis. Her test period may underestimate TPM because the BLS did not include non-market-based transfer prices until April 1998 (see endnote 9). Her dataset includes only 54 countries. The CIT rate is used is not the theoretically preferred rate for TPM (the statutory rate adjusted for tax preferences, see Eden, 1998, and Grubert and Slemrod, 1998). The paper does not examine other TPM-inducing policies such as foreign exchange controls. My work below builds on Clausing (2003) by fixing these problems and extending her research to focus on other market and government imperfections that could induce transfer price manipulation.

[2] If t_x is the statutory CIT rate and w_d the withholding rate, the total statutory tax rate on remitted profits is $t_x + w_d (1 - t_x)$ compared to t_x on retained earnings.

[3] The arm's length standard requires the MNE to set transfer prices as if the same transaction were between unrelated parties under the same circumstances (Eden, 1998).

[4] DTTs also lower withholding taxes. Since they are included above this link is taken into account.

[5] Before 1994, the BLS collected transfer prices only if they trended with the market price. All other transfer prices were considered out of scope and discarded. From 1994 on, the BLS collected all transfer prices were collected but did not use phase them in until February 1998. Since June 1998, all transfer prices are fully incorporated into BLS price data; therefore, the dataset starts in June 1998.

[6] I also tried lagging the exchange rate one period, with similar results.

[7] There are significant holes in this data, for example, FOB prices are often missing for imports from former USSR countries. Where data were missing, I imputed transportation rates based on the nearest country, by 3-digit SITC where possible. In some cases, only country-average rates could be calculated. I also tried using Great Circle Distance data but the results were stronger with the estimated CIF rates.

[8] Using a concordance from 5-digit to 3-digit codes meant that the scales vary from 0 to 2. Products with Rauch numbers between 0 and .667 were classified as organized exchanges, between .667 and 1.34 as referenced markets and over 1.34 as differentiated markets.

[9] The measures are from the importer's side of the market; there is no information on exporters.

[10] The difference between LNWTITCO and LNWTCOCLS is that the former measures the relative importance of the product to the firm, and the latter the relative importance of the firm to the market. Multiplying WTITCO by WTCOCLS gives us the ratio of firm j's imports of item i as a share of imports of all items in classif m by all importing firms.

[11] Clustering and absorption also reduce the size of the t-statistics and raise the adjusted R squared. Given the huge size of the sample, without clustering and absorption, all variables are significant at the .001 level, but the overall regression has little power.

[12] I adopt the convention of identifying a variable's coefficient as either positive or negative only if it is statistically significant; otherwise, the coefficient is assumed and reported to be zero.

[13] To save space I include IFT in the original regression, although it is not a control variable.

[14] An MNE was defined as any firm that engaged in at least one intrafirm trade transaction over the period; a non-MNE as a firm that engaged only in arm's length transactions.

[15] Going backward in time is inappropriate due to the way the BLS handled transfer prices.

Figure 1: The Internalization Benefits of Transfer Price Manipulation

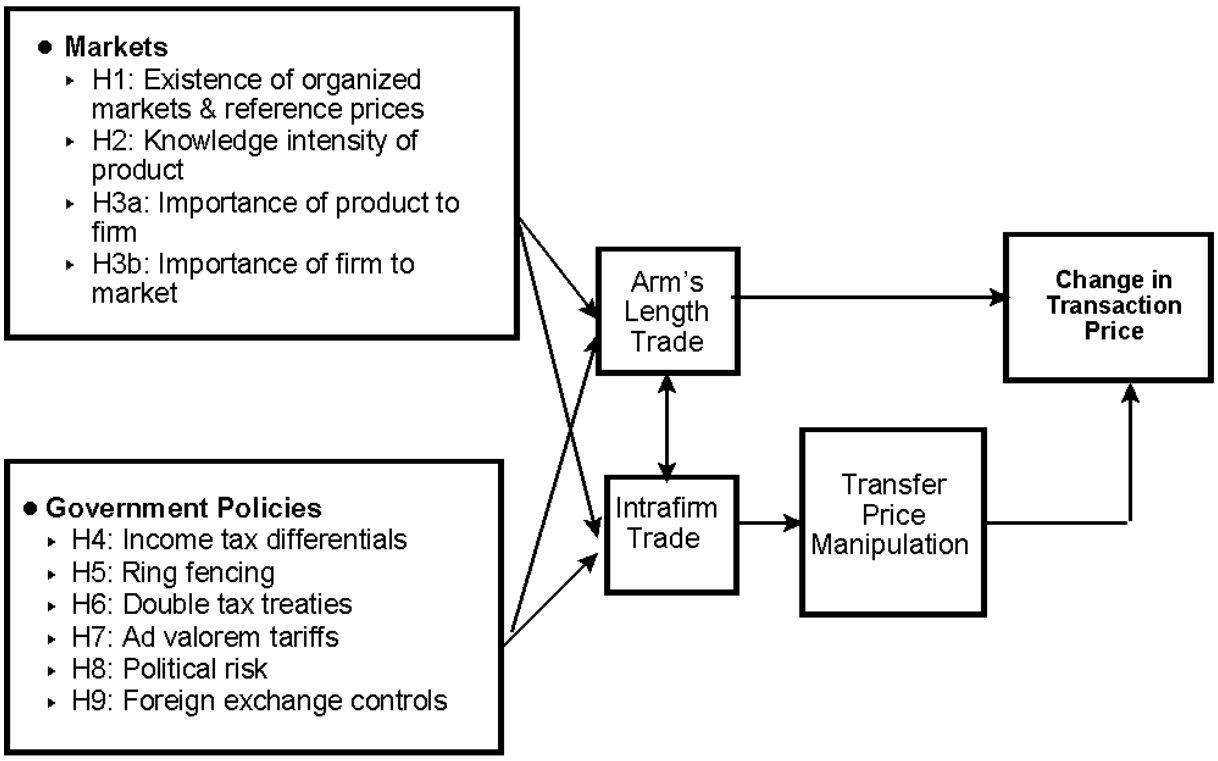

Table 1: Descriptive Statistics

	Variable	Mean	SD	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	216	27	28
1	LNPX	3.45	3.35																											
2	LINK	0.00	0.05	0.01																										
3	PXFLAG	0.69	0.87	-0.02	-0.04																									
4	LNEXRATE	-2.92	2.32	0.06	0.00	-0.01																								
5	INVOICEUS	0.91	0.29	-0.08	-0.00	0.10	-0.08																							
6	LNCIF	0.48	0.03	0.14	0.00	-0.02	0.07	-0.07																						
7	CANADA	0.07	0.26	0.05	0.01	-0.02	0.31	0.02	0.08																					
8	MEXICO	0.06	0.23	-0.05	0.00	0.04	0.07	0.08	0.13	-0.07																				
9	CHINA	0.09	0.29	-0.12	0.01	0.02	0.11	0.08	-0.13	-0.09	-0.08																			
10	JAPAN	0.18	0.38	0.13	-0.00	-0.04	-0.37	-0.05	0.15	-0.13	-0.11	-0.15																		
11	APPAREL	0.06	0.24	-0.06	-0.00	0.06	-0.06	0.07	-0.01	-0.07	0.04	0.08	-0.11																	
12	AUTO	0.06	0.24	0.11	0.01	-0.03	0.02	-0.02	0.05	0.11	0.02	-0.07	0.093	-0.06																
13	ELECTRIC	0.10	0.31	-0.16	0.01	0.01	-0.04	0.03	0.16	-0.08	0.04	-0.02	0.08	-0.09	-0.09															
14	OFFICE	0.06	0.24	0.12	0.00	0.02	-0.00	0.06	0.13	-0.05	-0.01	-0.02	0.07	-0.06	-0.06	-0.09														
15	TELECOM	0.06	0.23	0.05	-0.01	0.02	-0.03	0.05	0.11	-0.06	0.07	0.06	0.05	-0.06	-0.06	-0.08	-0.06													
16	IFT	0.41	0.49	0.16	0.01	-0.01	0.03	-0.04	0.17	-0.03	0.08	-0.20	0.22	-0.13	0.08	0.08	0.10	0.07												
17	RAUCH	1.77	0.47	0.14	0.01	-0.02	-0.06	-0.05	0.27	-0.13	-0.02	0.11	0.14	0.12	0.12	0.17	0.12	0.12	0.11											
18	MFGLMT	0.05	0.22	0.03	-0.01	-0.02	-0.04	-0.00	0.01	-0.05	-0.02	0.01	0.05	0.21	-0.06	-0.08	-0.06	-0.06	-0.01	0.12										
19	MFGHT	0.82	0.38	0.11	0.01	0.00	-0.03	-0.05	0.26	-0.14	-0.04	0.07	0.11	-0.04	0.12	0.16	0.12	0.11	0.14	0.47	-0.51									
20	LNWTITEM	-0.27	1.23	-0.01	0.00	-0.02	0.02	0.01	-0.07	0.02	0.04	-0.00	-0.04	0.03	-0.09	-0.08	-0.07	-0.06	0.02	-0.13	0.00	-0.09								
21	LNWTITCO	-0.96	1.07	-0.05	-0.00	0.03	-0.01	-0.02	-0.01	-0.02	-0.06	0.01	0.05	0.03	-0.01	0.03	0.00	-0.02	-0.02	0.01	0.03	0.00	0.11							
22	LWTCOCLS	-17.77	4.46	-0.15	0.01	0.03	-0.03	0.02	0.04	-0.04	-0.03	-0.05	0.01	-0.06	-0.14	0.41	-0.21	-0.04	0.03	-0.04	-0.06	0.03	0.14	-0.08						
23	LNTXMIN	-0.37	0.16	-0.20	-0.01	0.04	0.11	0.18	-0.15	-0.13	-0.10	0.41	-0.32	0.14	-0.11	0.03	0.05	0.07	-0.21	0.07	0.00	0.03	0.00	0.00	0.01					
24	LNTXGAP	0.05	0.04	-0.15	-0.00	0.02	0.05	0.09	-0.15	0.08	-0.28	0.50	-0.19	0.12	-0.08	-0.00	0.02	0.02	-0.18	0.07	0.02	0.01	0.00	0.02	-0.02	0.74				
25	TREATY	0.80	0.40	0.17	0.01	-0.03	-0.07	-0.13	0.10	0.14	0.12	0.16	0.23	-0.13	0.07	-0.07	-0.09	-0.03	0.15	-0.02	-0.02	0.02	0.01	-0.00	-0.05	-0.48	-0.20			
26	LNTARIFF	-0.04	0.04	0.09	0.00	-0.02	0.14	0.02	0.06	0.24	0.12	-0.20	0.02	-0.56	0.08	0.145	0.15	0.02	0.14	-0.17	-0.19	-0.08	-0.04	-0.06	0.13	-0.15	-0.13	0.05		
27	LNPOLRSK	3.05	0.32	-0.19	-0.00	0.06	-0.31	0.21	-0.20	-0.21	0.31	0.20	-0.26	0.21	-0.09	-0.02	-0.08	0.07	-0.22	-0.10	0.00	-0.10	0.06	-0.04	0.00	0.18	0.03	-0.09	-0.08	
28	FXCNTRL	0.76	0.78	-0.12	0.00	0.03	-0.23	0.15	-0.12	-0.28	-0.24	0.51	0.14	0.10	-0.05	0.04	0.05	0.05	-0.20	0.11	0.04	0.08	-0.02	0.04	0.02	0.20	0.30	-0.22	-0.18	0.26

All coefficients greater than (absolute value) .004 are significant at the 5 percent level.

Table 2: The Impacts of Market and Policy Variables on LNPX

LNPX	Hyp	Sign	1		2M		2P		2MP		3M		3P		3MP	
CONSTANT			2.023	**	1.252		3.013	***	2.231	*	2.066	*	2.729	**	2.771	**
LINK			0.102		0.085		0.1		0.082		0.076		0.097		0.07	
PXFLAG			0.022	*	0.025	*	0.024	*	0.026	**	0.023	*	0.024	*	0.025	*
LNEXRATE			0.044	***	0.04	**	0.043	**	0.04	**	0.04	***	0.04	**	0.036	**
INVOICEUS			-0.331	*	-0.346	*	-0.311	*	-0.325	*	-0.358	*	-0.306	*	-0.336	*
LNCIF			3.323	*	2.609	†	3.001	†	2.308		2.332		2.813	†	1.74	
CANADA			-0.403	*	-0.386	*	-0.401	*	-0.382	*	-0.368	*	-0.342	*	-0.293	†
MEXICO			0.046		0.017		0.035		0.013		0.009		-0.049		-0.056	
CHINA			-0.246	***	-0.232	***	-0.608	***	-0.601	***	-0.23	***	-0.554	***	-0.559	***
JAPAN			0.46	***	0.476	***	0.297	**	0.316	**	0.492	***	0.335	**	0.352	**
APPAREL			-0.252	*	-0.329	**	-0.225	†	-0.333	*	-0.346	***	-0.159		-0.271	*
AUTO			1.201	***	1.24	***	1.198	***	1.233	***	1.185	***	1.201	***	1.171	***
ELECTRIC			-0.979	***	-1.013	***	-0.968	***	-0.995	***	-1.016	***	-0.944	***	-0.983	***
OFFICE			0.812	***	0.859	***	0.822	***	0.881	***	0.818	***	0.891	***	0.927	***
TELECOM			1.068	***	1.033	***	1.096	***	1.063	***	1.004	***	1.108	***	1.04	***
IFT			0.207	*	0.164	†	0.194	*	0.152	†	-1.282	***	0.987		-0.244	
RAUCH	H1	+			0.372	**			0.368	**	0.06				0.03	
MFGLMT	H2	+			0.811	*			0.783	*	1.131	**			1.192	**
MFGHT	H2	+			0.672	**			0.642	*	0.864	**			0.9	**
LNWTITEM	H3a	-			0.13	***			0.129	***	0.074	**			0.073	**
LNWTITCO	H3a	-			-0.204	***			-0.207	***	-0.124	***			-0.123	***
LNWTCOCLS	H3b	-			0.016	*			0.016	*	0.029	**			0.028	**
LNTXMIN	H4	+					1.000	**	1.005	**			0.392		0.417	
LNTXGAP	H5	-					-2.024	†	-1.897	†			-0.182		-0.045	
TREATY	H6	+					0.466	***	0.47	***			0.345	***	0.341	***
LNTARIFF	H7	+					-0.093		-0.576				0.973		0.785	
LNPOLRSK	H8	-					-0.261	**	-0.256	**			-0.21	*	-0.192	*
FXCNTRL	H9	-					0.111	*	0.105	*			0.128	**	0.125	**
IFT*RAUCH	H1	+									0.677	***			0.765	***
IFT*MFGLMT	H2	+									-0.588				-0.877	*
IFT*MFGHT	H2	+									-0.309				-0.5	*
IFT*LNWTITEM	H3a	-									0.115	**			0.116	**
IFT*LNWTITCO	H3a	-									-0.159	***			-0.166	***
IFT*LNWTCOCLS	H3b	-									-0.022	*			-0.018	

IFT*LNTXMIN	H4	+											1.909	**	2.037	**
IFT*LNTXGAP	H5	-											-6.543	**	-6.769	**
IFT*TREATY	H6	+											0.359	*	0.447	**
IFT*LNTARIFF	H7	+											-4.63	*	-5.866	**
IFT*LNPOLRSK	H8	-											-0.042		-0.118	
IFT*FXCNTRL	H9	-											-0.171	†	-0.153	†
NO OF OBS			260079		260079		260079		260079		260079		260079		260079	
ADJ R SQ			0.7306		0.7346		0.7311		0.7352		0.7355		0.7316		0.7367	
F			7.35	***	9.38	***	7.32	***	9.06	***	9.03	***	7.02	***	8.51	***
Δ F DIST					22.92	***	5.81	***	6.08	***	5.41	***	4.51	***	5.64	***
					2Mv1		2Pv1		2MPv2M		3Mv2M		3Pv2P		3MPv2MP	
									22.95	***					5.53	***
									2MPv2P						3MPv3M	
															6.13	***
															3MPv3P	
CHOW TEST											4.97	***	4.97	***	5.62	***

Significance levels (two-tailed test): *** p < .001, ** p < .01, * p < .05, † < .01.

Table 3: Subgroup Comparisons

	ALL (1)	IFT ONLY (2)	ALT ONLY (3)	MNES (4)	NON-MNES (5)	BIG FIRMS (6)	SMALL FIRMS (7)	RAUCH DIF (8)	RAUCH OE-REF (9)	HIGH TECH MFG (10)	LW-MD TECH MFG (11)	PRIM-ARY (12)	IFT & HIGH TAX (13)	IFT & LOW TAX (14)
LINK			+		+		+	+	-					
PXFLAG	+		+		+					+	+	+		-
LNEXRATE	+	+		+		+		+	+	+		+		
INVOICEUS	-	-		-	-	-		-		-		+		
LNCIF						+		+		+			+	+
CANADA	-			-		-			-			-	-	d
MEXICO		+									-	-	d	+
CHINA	-	-		-		-	-	-		-			d	d
JAPAN	+		+	+	+	+			+			+	-	d
APPAREL	-						-	-	d	-		d	+	
AUTO	+	+		+		+	+	+	d	+	d	d	+	
ELECTRIC	-	-	-	-		-	-	-	d	-	d	d	-	-
OFFICE	+	+		+	+			+	d	+	d	d	+	
TELECOM	+	+	+	+	+		+	+	d	+	d	d	+	
IFT	+	d	d		d			+		+			d	d
RAUCH	+	+		+		+		+		+	d	-	+	+
MFGLMT	+		+	+				+	d	d	d	d		
MFGHT	+		+	+				+		d	d	d		
LNWTITEM	+	+	+	+		+		+	+	+			+	+
LNWTITCO	-	-	-	-	-	-	-	-		-			-	-
LWTCOCLS	+		+		+	+		+		+				
LNTXMIN	+	+		+		+	+	+	+	+				
LNTXGAP	-						-	-		-			+	
TREATY	+	+	+	+		+	+	+		+			d	
LNTARIFF		-	+							-	+			-
LNPOLRSK	-		-		-	-	-	-		-				
FXCNTRL	+	+		+		+	+	+		+			+	
OBS	260079	107809	152270	137564	122515	130056	130023	210221	49858	213823	13786	32470	57158	24229
ADJ RSQ	.7352	.7155	.7941	.6809	.8145	.8116	.7470	.7400	.7560	.7322	.8701	.8181	.6965	.8176
F	9.06***	8.00***	4.82***	8.46***	6.66***	6.04***	4.29***	9.98***	2.22***	9.73***	2.67***	2.37***	5.46***	4.05***
M1: Product	5.57***	5.29**	3.99**	6.44***	n.s.	8.41***	n.s.	7.72***	n.s.	2.79†	d	3.31†	n.s.	2.95*
M2: Firm	40.09***	23.25***	11.03***	36.80***	13.85***	14.40***	4.71**	53.34***	n.s.	37.78***	n.s.	n.s.	12.12***	12.73***
P1: Tax	8.78***	12.36***	n.s.	9.78***	n.s.	4.19**	5.32**	10.43***	n.s.	9.00***	n.s.	n.s.	4.55*	n.s.
P2: General	5.77***	6.65***	3.51*	6.28***	3.89**	5.01**	4.65**	5.71***	n.s.	9.29***	n.s.	n.s.	4.69**	2.14†

Only the signs of variables significant at the 10% level or better (two-tailed test) are reported; d = dropped from regression.

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