Introduction

Multinational Enterprises (MNEs) around the world are restructuring their supply chains. As trade barriers fall and communications technologies improve, businesses are reorganizing and relocating business processes to perform them in the most cost-effective manner. While they do this, businesses are shifting activities from high-tax to low tax jurisdictions. Tax authorities in many countries are concerned with this trend. At the same time, consulting firms are promoting “tax efficient supply chain” consulting services. They aim to assist firms reduce tax obligations while restructuring their supply chain.

Tax journals have noticed this growing trend. A recent article in the Bulletin for International Taxation, “Re-engineering Multinational Supply Chains,” focused on the tax impact of supply chain restructuring. “The globalization of markets and products and the development of technology have created an impetus for specialization within multinational groups,” the authors write. “The co-existence of low-cost and high-cost jurisdictions drives cost reduction strategies, including transportation costs as well as those associated with labor-intensive activities.” These restructurings have reduced tax revenue. “Whether motivated by commercial or tax reasons, some countries have observed a reduction in tax revenues when modern business models are adopted compared with more traditional models.” The article summarized the discussions of tax practitioners from France, South Africa, Switzerland, Mexico, Argentina and the United States who all have observed this trend.

The International Transfer Pricing Journal recently featured six articles focusing upon the tax consequences of supply chain restructurings. Authors representing Belgium, France, the Netherlands, Spain, the United Kingdom and the United States each discussed developments in their country. Tax authorities in these high income-tax countries are concerned that supply chain restructurings are reducing their tax revenue. Describing the situation in the United States, the article noted “Supply chain management structures are increasingly used by multinational enterprises (MNEs),” the author writes. “Such business activities give rise to transfer pricing opportunities that, many times, result in a
reduction of taxable income in high-tax jurisdictions. The tax authorities in high-tax jurisdictions have, as a result of the changes in taxable income in their jurisdictions, become very interested in auditing these structures.”7 Tax authorities in France are also concerned about lost tax revenue. “For a number of years, supply chain management (SCM) structures have been implemented in Europe in order to respond to the demand of clients, to reduce costs and to allow efficiency to the benefit of both the clients and the companies themselves,” the author writes. “Additionally, the implementation of such structures may permit tax reductions.”8 Tax authorities in the Netherlands believe this is one of their most important issues. “Cross-border restructuring of multinational enterprises (MNEs) is an issue that is high on the agenda of the Dutch tax authorities. In fact, the trend towards outsourcing; transferring production and other activities to countries with low labor costs; and moving leadership and risk-taking functions to low-tax countries are all elements that may trigger loss of employment and a reduction of the taxable base in the Netherlands. The relevant tax aspects of such changes are closely monitored by the tax authorities.”9

Some authors argue supply chain restructurings are driven primarily by operational objectives, rather than tax considerations. “The impact of the supply chain model on tax is probably not always at the forefront of the managers’ minds,”10 report United Kingdom tax practitioners. “Whether the decisions made increase or decrease the MNE’s effective tax rate is often a secondary consideration, but no less important.”11 But others believe reducing tax obligations may be a primary motivation. “There are well over 100 companies (many in the FTSE 100) that have significantly restructured their business operations to optimize their tax position. This has resulted in substantial improvements in levels of profitability (up to 25%) and can be the single biggest lever for improving profit margins (ahead of cost efficiencies and marketing spend). This type of restructuring is gathering momentum and growing in awareness. It has significant implications for competitiveness, company culture and the organizational model, as well as fiscal relationships,”12 said an article in Supply Chain Europe. Whether motivated primarily or secondarily by tax considerations, it appears MNEs are simultaneously restructuring their supply chain and moving activities from high-tax locations.
This paper’s purpose is to demonstrate that Multi-National Enterprises (MNEs) should consider income taxes when making supply chain decisions and determining where to locate their business activities. This recommendation differs from the great majority of supply chain papers, which generally recommend businesses should seek to minimize pre-tax costs. It contributes to knowledge of business location decisions by explaining how linking supply chain and income tax analysis can lead to better decisions and improve net income. One of the most important activities for both supply chain and tax organizations is determining where business operations should be located, so these organizations should collaborate to make optimal decisions. Most supply chain literature ignores income tax impact. As one article noted: “one of the single biggest costs of managing a supply chain has often gone unaddressed: tax.”\textsuperscript{13} This paper demonstrates why supply chain decisions need to consider income tax impact. This paper also analyzes the MNE’s legal model to determine the best opportunities to develop an income tax efficient supply chain. It provides evidence that some businesses link supply chain and income tax decisions. It also explains why and how firms can improve profits by integrating supply chain and income tax planning.

**Income Tax Efficient Supply Chain Planning**

Income tax rates vary substantially from country to country. While corporate profits are taxed at nearly 40% in high-tax countries, such as Japan,\textsuperscript{14} income tax rates are as low as 2% in other jurisdictions, such as Puerto Rico.\textsuperscript{15} Low tax jurisdictions are commonly labeled as tax havens. “A tax haven is a country where either locally sourced income or residents are subject to no or low internal taxation,”\textsuperscript{16} according to one tax text. MNEs can substantially reduce income taxes by moving business operations to tax havens.

Transferring operations abroad can frequently draw scrutiny from tax authorities, as these business decisions can reduce government tax revenue. Therefore firms must be careful to comply with local and international tax laws. While tax laws differ from one country another, United States tax laws do not discourage firms from pursuing legal means to
minimize taxes. The U.S. perspective may be summarized by several well-known statements of the late U.S. Supreme Court Justice Learned Hand. Judge Hand wrote: “Over and over again courts have said there is nothing sinister in so arranging one’s affairs to keep taxes as low as possible. Everybody does so, rich and poor; and all do right, for nobody owes any public duty to pay more than the law allows: taxes are enforced extractions, not voluntary contributions. To demand more in the name of morals is mere cant.”

In another opinion Judge Hand wrote: “Any one may so arrange his affairs that his taxes shall be as low as possible; he is not bound to choose that pattern which will best pay the Treasury; there is not even a patriotic duty to increase one’s taxes…”

As income taxes are often one of a firm’s largest costs, firms engage in tax planning to minimize this expense. Tax planning uses legal means to arrange business activities to minimize tax obligations. One tax text notes: “The primary purpose of effective tax planning is to reduce the taxpayer’s total tax bill. This reduction does not mean that the course of action selected must produce the lowest possible tax under the circumstances. The minimization of tax payments must be considered in the context of the legitimate business goals of the taxpayer.”

Firms must be careful to use only legal means to reduce tax obligations. “A fine line exists between legal tax planning and illegal tax planning—tax avoidance versus tax evasion. Tax avoidance is merely tax minimization through legal techniques. In this sense, tax avoidance becomes the proper objective of all tax planning. Though eliminating or reducing taxes is also a goal of tax evasion, the term implies the use of subterfuge and fraud as a means to this end.” Tax evasion penalties differ from country to country, but in some nations they can be substantial, and provide strong incentive to comply with tax laws. For example, in the United States 40% transfer pricing penalties can be added to the tax obligation, along with accrued interest.

Tax laws are frequently considered complex, and international tax laws are even more so, as they frequently differ between countries. However there are certain common
principles to which firms must adhere. Two important international tax principles are the “arms-length principle” and the “business purpose doctrine.”

The arms-length principle governs how MNE subsidiaries value product sales and services performed for a related business entity. When a MNE operates in more than one country, it typically creates a new legal entity to facilitate legal operations in that jurisdiction. Often that entity needs to buy or sell products from other legal entities within the same business enterprise. “An important presumption about market transactions is that the parties are negotiating at arms-length. In other words, each party is dealing in its own economic self-interest, trying to obtain the most advantageous terms possible from the other party.” The arm’s-length principle is supported in many other countries, and is cited as the key principle in the OECD’s Transfer Pricing Guidelines for Multi-National Enterprises and Tax Administrations.

The business purpose doctrine says a business transaction should have some purpose other than tax reduction. It states “a transaction should not be effective for tax purposes unless it has a genuine business purpose other than tax avoidance. The lack of any business purpose by the participants can render a transaction meaningless, at least from the perspective of the IRS, even if the transaction literally complies with the law.” This places limitations on Judge Hand’s statements. Judge Hand said tax reduction is a legitimate objective, but the business purpose doctrine says tax reduction cannot be the only purpose. For this reason, tax practitioners frequently emphasize the operational benefits of restructurings that also reduce taxes. They can argue to tax authorities that the restructuring was done for primarily to achieve operational goals, and that tax reductions were a byproduct of restructurings made for other business purposes.

Selecting a business location involves many considerations, so MNEs can generally find a legitimate business purpose for transferring operations elsewhere. Business objectives might include proximity to customers, risk diversification, low wage rates, or easy access to materials suppliers. However not all businesses transfer operations to low tax countries. If a business has the opportunity to reduce taxes by transferring operations
abroad, why would it not choose to do so? Taxes are not the only consideration. There are many factors firms evaluate when determining where to locate operations, such as employee skills and availability, political stability, and an adequate local infrastructure, among other factors. Supply chain costs are an important consideration. Companies seeking to maximize profits need to balance income tax savings against these other considerations. Income taxes may be reduced by operating in a low-tax jurisdiction, but transferring operations to another location will change the supply chain and associated costs. In an optimal situation, the firm will identify an alternative that will reduce both income taxes and supply chain costs. But in many cases it may not be possible to minimize both income taxes and supply chain costs. One alternative might reduce income taxes, but increase supply chain costs. Another might reduce supply chain costs but increase income taxes.

**The Income Tax Efficient Supply Chain**

International tax and supply chain planning are frequently viewed as unrelated activities. Supply chain managers and tax directors have different proficiencies and their reporting relationships differ. Supply chain management is a line activity, the department generally reports to manufacturing or operations managers, and it is staffed by supply chain and manufacturing analysts. In contrast, tax is a staff activity, the department typically reports to the Chief Financial Officer, and tax departments employ tax attorneys and Certified Public Accountants or Chartered Accountants. As a result, these departments frequently do not collaborate. As one article noted “tax professionals have typically limited their discussions to a company’s financial group”\(^{25}\) and as a result may not participate in supply chain decisions.

In addition, tax and supply chain organizations often attempt to achieve different objectives. Supply chain managers generally aim to minimize pre-tax costs, while achieving delivery and inventory management objectives.\(^{26}\) In contrast, tax departments seek to maximize net income, while complying with tax laws. Differing objectives also discourage collaboration. One article stated: “Typically, corporate tax professionals are
measured on a ‘no surprises’ basis and are seldom looked at for innovations.” The author wrote: “Commonly, this had led to a disconnect between pragmatic operational logistical planning and the most sustainable form of tax planning—functional-based tax planning,” to be explained later in this paper.

Despite this disconnect, one of the most important activities for both supply chain organizations and tax departments is recommending where to locate business activities. Supply chain departments determine where to procure materials, manufacture products, and distribute finished goods. These location decisions can have a substantial impact on income tax obligations, as tax rates vary substantially from country to country. As one article noted: “In an environment where supply chains are trying to respond to…pressures, a focus on tax has not seemed the most obvious or relevant course of action. It can, however, be complementary to most of these changes and at the same time deliver significant benefits.”

Decisions made to reduce income taxes can also have a major impact upon supply chain costs. “Tax issues permeate every aspect of identifying, acquiring, importing, transporting, distributing and selling goods,” said one article. For this reason, supply chain organizations and tax departments should collaborate to achieve a common goal of maximizing net income. When supply chain organizations aim to minimize pre-tax supply chain costs, they ignore income tax impact. Tax departments limit their potential to increase net income when they do not contribute to supply chain decisions. Furthermore, there is evidence some MNEs integrate supply chain and income tax planning when determining where to locate business operations.

The Supply Chain
The supply chain is an integrated process in which a number of business entities, including materials suppliers, manufacturers, distributors and retailers work together to acquire raw materials, convert materials into finished goods, and deliver products to customers.31 “It is propelled by the realization that no organization can be good at all things, and by the expanding reach and ease of access to information and communication technology.”32 In recent years optimizing the supply chain has received considerable attention in business and academia, driven by the desire to reduce cost structures, improve customer satisfaction and increase operating efficiency.

The supply chain includes two sub-processes. The first, production planning and inventory control, includes manufacturing and inventory storage policies. The second, distribution and logistics, delivers finished goods to customers. Distribution costs include can include shipping costs, tariffs, and all other costs related to delivering finished goods to customers. An overview follows:

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Figure 1: The Supply Chain Process
MNEs are changing the way they manage the supply chain. Reduced barriers to trade, agreements to reduce tariffs and duties, outsourcing alternatives and increased focus on core competencies have all generated interest in supply chain management. One article commented: “The competitive environment in a global economy has accelerated change among MNEs. Companies are increasingly focused on product specialization and optimization of their entire value chain. Business restructuring is often geared towards centralizing key functions and decision making, and this is enabled by more transparency and availability of data through information technology. Such changes typically entail a transfer of functions and risks from a local-country level to one central location.”33

Improved communications technologies have also enabled supply chain process improvements. “The transaction costs are further nose-diving due to cheaper telecommunications and the emergence of the Internet,”34 one article said. Cost-effective communications technologies, such as the Internet and Enterprise Resource Planning (ERP) information systems, make it easier to manage business processes across international boundaries.

Some analysts believe there has been “a movement away from the classic multinational style of operating relatively autonomous domestic firms in each country of operation. The global supply chain is characterized by the linkage of decision making at all levels of the firm’s supply chain, i.e., across regional, functional and even interfirm boundaries.”35

For example, IBM is dramatically altering the roles and responsibilities of its subsidiaries:

“Sam Palmisano, IBM’s boss, foresees nothing less than the redesign of the multinational company. In his scheme, multinationals began when 19th-century firms set up sales offices abroad for goods shipped from factories at home. Firms later created smaller ‘Mini Me’ versions of the parent company across the world. Now Mr. Palmisano wants to piece together worldwide operations, putting together different activities wherever they are done best, paying no heed to arbitrary geographic boundaries. That is why, for example, IBM now has over 50,000 employees in India, and ambitious plans for further expansion there. Even as India has become the company’s second-biggest operation outside America, it has moved the head of procurement from New York to Shenzhen in China.”36
In short, supply chain management has become a key business process. Corporations are centralizing supply chain management to perform activities where they can be done most efficiently, frequently ignoring national boundaries. Improved information systems, trade agreements and tariff reductions have motivated and enabled supply chain restructurings. And tax issues permeate supply chain decisions. “Supply chains are not static structures. In fact, the structure of supply chains is constantly changing, as are the products they convey. The need for agility in the structure of supply chains leads to ongoing opportunities for tax efficiency or tax inefficiency…” 37 Another article commented: “When geographic markets were more distinct, transport was more expensive, communication harder and information less widespread, supply chains were easier to understand and national businesses within an MNE more likely to operate on a stand-alone basis. This is no longer true; reductions in trade barriers coupled with the increasing need to capture increased value or greater cost effectiveness, has caused many MNEs to rethink their supply chains to cater for these changes in the global economy.” 38

To limit scope, this paper is directed towards the impact of supply chain restructuring on income taxes. However other taxes, such as transaction taxes (value-added taxes and sales taxes) and property taxes may be also be impacted by supply chain restructurings, and should be considered.

**Measuring the Supply Chain**

An effective supply chain must achieve many objectives. To satisfy customers, the supply chain must deliver products to customers where and when they want them. Minimizing inventory levels and obsolescence are important operating efficiency objectives. Firms also want to minimize supply chain risks, such as unreliable suppliers and operating in unstable locations. And cost containment is generally a key business objective. Effective supply chains must balance these goals, improve profits, and ultimately add shareholder value.

A 1998 article in The Journal of Production Economics surveyed significant supply chain management literature. It reviewed 29 supply chain management articles, and identified ten supply chain performance measures, shown below:
<table>
<thead>
<tr>
<th>Objective</th>
<th>Performance Measure</th>
<th># Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Goals</td>
<td>Minimize Cost</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Maximize Net Profit</td>
<td>1</td>
</tr>
<tr>
<td>Inventory Management</td>
<td>Minimize Average Inventory</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Minimize Obsolete Inventory</td>
<td>1</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>Minimize product demand variance</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Maximize on time delivery</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Minimize stockout probability</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Maximize available system capacity</td>
<td>1</td>
</tr>
<tr>
<td>Multiple Goals</td>
<td>Maximize buyer-supplier benefits</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Minimize activity days and total cost</td>
<td>1</td>
</tr>
</tbody>
</table>

Total 29

Note that only one of the 29 articles recommended supply chain managers should aim to maximize net income. Similarly, a recent supply chain identified six frameworks to evaluate the supply chain. Four emphasize cost management, and two stress business process success. Only one of the six measures, Return on Assets, employs net income. And while it recommends using net income to measure supply chain efficiency, it does not discuss the trade-offs that may exist between income tax and supply chain objectives, or explain how focusing on net income can change traditional supply chain management.

However net income is a primary driver of shareholder value. In Financial Reporting: Financial Statement Analysis and Valuation authors Stickney, Brown and Wahlen conclude that net income and free cash flow are the two most important measures of shareholder value. They also argue cash flow should also be analyzed net of income taxes. They state: “the analyst should use after-tax free cash flows and the after-tax cost of capital.” It can be debated whether income or cash flow is a better measure of shareholder value, but ignoring income taxes is a mistake in either case. There are strong arguments for each measure, but they conclude net income is more popular, as the figure is readily available. “The earnings number is the single most widely followed measure of...
firm performance,” they write. Given the figure’s ready availability, this paper will emphasize measuring and improving net income.

The other supply chain measures proposed generally support maximizing net income. These metrics focus on activities controllable by supply chain managers and are justifiable when they contribute to profit maximization. At first glance, all of these measures appear to support maximizing net income. But in some instances the most popular metric, pre-tax cost minimization, may actually conflict with net income maximization. And cost minimization, while an important business metric, is not the most important driver of shareholder value.

Cost Minimization and Profit Maximization

To illustrate this, consider the following example. A supply chain manager must decide between two manufacturing locations. The first option minimizes supply chain costs, and is closer to suppliers and customers. The second location is further from suppliers and customers, and wages are higher. Per unit manufacturing costs are shown below:

<table>
<thead>
<tr>
<th>Cost per unit</th>
<th>Option One: Lower Supply Chain Costs</th>
<th>Option Two: Higher Supply Chain Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inbound Logistics</td>
<td>$2</td>
<td>$4</td>
</tr>
<tr>
<td>Materials</td>
<td>$30</td>
<td>$30</td>
</tr>
<tr>
<td>Labor</td>
<td>$10</td>
<td>$20</td>
</tr>
<tr>
<td>Shipping/Outbound Logistics</td>
<td>$2</td>
<td>$4</td>
</tr>
<tr>
<td>Total Supply Chain Costs</td>
<td>$44</td>
<td>$58</td>
</tr>
</tbody>
</table>

Table 1: Supply Chain Costs

If a supply chain manager’s goal is to minimize supply chain costs the first option is superior. Inbound logistics, wages and outbound logistics costs are lower. But reducing supply chain costs does not necessarily maximize net income. The income tax impact may outweigh supply chain savings. If income taxes are considered, the second option may be superior. Suppose a transfer price of $200 from both locations, and a lower income tax rate in the second location.
<table>
<thead>
<tr>
<th></th>
<th>Option One: Lower Supply Chain Costs</th>
<th>Option Two: Higher Supply Chain Costs</th>
<th>Difference (1-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer Price</td>
<td>$200</td>
<td>$200</td>
<td>--</td>
</tr>
<tr>
<td>Total Supply Chain Costs</td>
<td>$44</td>
<td>$58</td>
<td>($14)</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>$156</td>
<td>$142</td>
<td>$14</td>
</tr>
<tr>
<td>Tax Rate</td>
<td>35%</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>Taxes</td>
<td>$54.60</td>
<td>$35.50</td>
<td>$19.10</td>
</tr>
<tr>
<td>Net Profit</td>
<td>$101.40</td>
<td>$106.50</td>
<td>($5.10)</td>
</tr>
</tbody>
</table>

Table 2: Net Profit Comparison

While option one minimizes supply chain costs, option two maximizes net income.

This is a not merely a theoretical concern; it has very practical consequences. Businesses regularly reshape their supply chains, looking for ways to reduce their cost structure, and improve inventory management and customer satisfaction. MNEs now regularly transfer business operations from one country to another. Supply chain decisions that ignore income taxes may actually reduce net income and shareholder value. Businesses should consider tax consequences to make optimal supply chain decisions.

The example above assumes the same $200 transfer price from either location. IRS §482 regulations identify five acceptable transfer pricing methodologies. Three of the five methods specified in U.S. transfer pricing law should generate the same transfer price. The “comparable uncontrolled price method,” “resale price method,” and the “comparable profits” method can each achieve this result.

IRS regulations state: “The comparable uncontrolled price method evaluates whether the amount charged in a controlled transaction is arm’s length by reference to the amount charged in comparable uncontrolled transaction.” In this approach, transfer prices should be determined by evaluating external prices for comparable sales, which serve as the same reference point for transfer price calculation. Concerning the second method the regulations state: “The resale price method measures the value of functions performed, and is ordinarily used in cases involving the purchase and resale of tangible goods in which the reseller has not added substantial value to the tangible goods by
physically altering the goods before resale.” Treasury regulations say: “If an applicable resale price (in the uncontrolled transaction) of the property involved in the controlled transaction is $100 and the appropriate gross margin is 20%, then an arms-length result of the controlled sale is $80 ($100 minus (20% x $100)). This would be the appropriate transfer price from all internal suppliers. The third approach, the comparable profits method, is very similar to the resale price method, but the organization’s operating profit is evaluated instead of gross profit. “Under the comparable profits method, the determination of an arms-length result is based on the amount of operating profit that the tested party would have earned on related party transactions if its profit level indicator were equal to that of an uncontrolled comparable, and applying the profit level indicator to the financial data related to the tested party’s most narrowly identifiable business activity for which data incorporating the controlled transaction is available…”

Under each of these three methods, the purchaser’s transfer price should be the same, without regard to which internal supplier provided the product. Furthermore, IRS regulations do not permit taxpayers to pick and choose from the five methods when determining transfer pricing policies. The firm is bound by the best method rule, which says: “The arm’s length result of a controlled transaction must be determined under the method that, under the facts and circumstances, provides the most reliable measure of an arm’s length result.” The IRS directs taxpayers to select the method that best supports the arms-length principle, not the most advantageous method. If one of the three methods above is the most reliable basis for determining arms-length results, it should be used. As Thomas Gresik writes “The ‘best method’ provisions legally obligate the transnational to prove its method best approximates an arms-length price…”

Within the United States, the IRS imposes substantial penalties for not complying with transfer pricing laws. First, the IRS can adjust transfer prices to bring them in line with the arms-length standard. In addition, the IRS can impose substantial penalties on top of the adjustment, penalties which are not tax deductible. Many believe these penalties have motivated U.S.-based firms to be more careful to comply with transfer pricing laws. “Procedural changes have made it less attractive to litigate transfer pricing disputes.
First, Congress provided for transfer pricing penalties equal to 20% and 40% of the ultimate §482 adjustment. The trigger for penalties is $5 million of aggregate misstatements. For a multinational corporation with billions of dollars of inter-company transactions, this threshold is easily reached.\textsuperscript{52} The 20% penalty is for “accuracy-related”\textsuperscript{53} issues, and the 40% penalty is assessed for “gross misstatement.”\textsuperscript{54} And on top of the transfer pricing adjustment and the non-deductible penalty, firms must also pay accrued interest.\textsuperscript{55} In one well known transfer pricing case, in 2006 the IRS reached a $3.4 billion transfer pricing settlement with GlaxoSmithKline.\textsuperscript{56}

**International Tax Planning**

When businesses expand across international boundaries, they frequently create foreign subsidiaries to facilitate doing business. MNEs form these organizations to comply with legal requirements, limit parent company liability, and determine tax obligations. One text states: “Firms must be aware of the foreign tax implications of international operations. When a U.S. firm plans to expand its activities into another country, it should identify the taxes included in the country’s fiscal structure. The firm’s liability for these taxes will depend on the nature and extent of its activity within the country and whether such activity triggers the country’s taxing jurisdiction.”\textsuperscript{57}

International businesses frequently transfer inventory and fixed assets from one country to another. MNEs might invent products in one country, manufacture them in a second, store them in a third, and sell them to customers in a fourth location. Since these activities cross international boundaries, MNEs need to calculate income in each locale to comply with local tax laws. Transfer prices for inventory, assets and services need to be calculated based on the arms-length standard.

Determining an arms-length transfer price is not always easy to do. Comparable trade prices are usually the starting point to determine a transfer price, but it may be challenging to find such prices. This is particularly true when the MNE is vertically integrated, and it transfers work-in-process inventory between business entities. Firms rarely sell partially completed goods to external customers, making external price
comparisons difficult to obtain. Centralized supply chain planning may increase work-in-process inventory transfers, as businesses shift manufacturing processes to the most efficient provider.

Transfer prices determine the revenue and income earned, as thus the taxes owed, in various jurisdictions. They are important both to tax authorities and MNEs. Income tax rates can vary substantially between countries. As previously mentioned, income tax rates can range from 2% in Puerto Rico to nearly 40% in Japan. Due to substantial tax rate differences, businesses have an incentive to minimize their worldwide tax expense, while complying with international tax laws.

MNEs frequently form subsidiaries to perform specific business purposes. These objectives may include inventing products, manufacturing products, distributing them, or selling goods and services. Forming subsidiaries to perform specific activities facilitates functional-based tax planning. This approach supports the:

“principle that underlies many of the world’s taxing regimes: The income on which a company is taxed should reflect the functions the company performs, the risks the company takes on, and the assets the company has at its disposal. More specifically, companies earn separately identifiable economic returns on the functions they perform, the risks they take, and the assets they own or have developed. These distinctions are muted when an enterprise operates worldwide on a vertically integrated basis. However, they become significant once a company begins to isolate functions, risk, or assets in specific entities within the corporate group and ultimately deploys them in certain jurisdictions.”

Creating entities for specific purposes facilitates transfer price determination. If external price comparisons are not available, one alternative is to determine an arms-length return for a specific business function. For example, suppose a U.S.-based business decides to sell products in Canada. It plans to continue inventing and manufacturing products in the United States, and to sell them in the United States and Canada. It forms a Canadian sales subsidiary to do this. Its products are unique, and comparable trade prices are difficult to establish. However it can determine profit margins for comparable sales
companies. Transfer prices could be calculated so the Canadian subsidiary could achieve a gross margin or return on sales figure comparable to similar trade businesses.

Larger enterprises may have more elaborate value chains. These activities might include research and development, manufacturing, distribution, and sales. In the following graphical depiction, the MNE’s arms-length transfer pricing policies must apportion profit between legal entities.

![Figure 2: Income Tax Planning](image)

Note: Intellectual Property Development, the Manufacturing Corporation, the Distribution Center, and the Sales Corporation are all part of the same Multi-National Enterprise (MNE).

In this model, the intellectual property owner invents products and transfers the right to build them to the manufacturing corporation. After production is complete, the manufacturing corporation ships products to the distribution center, which stores them until they are sold. The sales corporation makes the trade customer sale. As the MNE operates in four different countries, it must pay income taxes in each. Tax rates may differ, so the MNE will want to structure its operations to minimize tax obligations, while complying with tax laws and the arm-length principle. Firms can “capitalize on the
fundamental tax principle that income follows functions, risks and assets.”

The MNE assigns legal responsibilities to maximize profit in low-tax jurisdictions. “By altering the relationship between the principal and affiliate, the amount of income properly attributable to the affiliate can be reduced, thereby lowering the local-country tax.”

For example, the firms could assign certain risks, such as warranty obligations, to the legal corporation that has the highest profit potential, located in a low-tax jurisdiction. Because it absorbs the most risk, it should earn the highest profit. At the same time, organizations that accept less risk, often in high-tax jurisdictions, merit less profit.

This approach increases total business risk. If profitable, the MNE lowers its tax rate. But if the MNE records losses, they are absorbed in the low-tax jurisdiction, and its worldwide tax rate increases. But this is the risk the firm knowingly takes to reduce its worldwide tax rate. If a firm believes it can consistently earn high profit margins, it is a risk worth taking.

**Tax Law: Exemption versus Tax Credits**

As discussed, companies operating abroad form subsidiaries to conduct business. They do this to comply with local laws and determine tax obligations. However, tax laws differ substantially from country to country. In general, parent countries tax business earnings using one of two methodologies. The majority tax only domestic earnings, while several countries tax worldwide earnings.

Taxing only domestic earnings is the simplest and most popular approach. In other words, the parent-country levies income taxes only on the domestic entity, and ignores income earned by foreign subsidiaries. Overseas subsidiary profits are taxed by those jurisdictions. The following example illustrates that approach. For simplicity, all figures will be presented in dollars.

Suppose a German-based corporation owns a Mexican subsidiary. The company earns $200,000 in Germany, and $100,000 in Mexico. If the German tax rate is 39% and the Mexican tax rate is 50%, it would owe $78,000 in German income tax, and $50,000 in
Mexico. Income earned in Mexico would have no impact on taxes owed in Germany, and the company’s worldwide tax rate would be 42.7%.

<table>
<thead>
<tr>
<th>German-based Firm</th>
<th>German Parent</th>
<th>Mexican Sub.</th>
<th>Worldwide Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings</td>
<td>$200,000</td>
<td>$100,000</td>
<td>$300,000</td>
</tr>
<tr>
<td>Tax Expense</td>
<td>$78,000</td>
<td>$50,000</td>
<td>$128,000</td>
</tr>
<tr>
<td>Tax Rate</td>
<td>39%</td>
<td>50%</td>
<td>42.7%</td>
</tr>
</tbody>
</table>

Table 3: International Tax Exemption System

In contrast to the exemption system, several countries tax the worldwide earnings of businesses headquartered there. Italy, Japan, Norway, the United Kingdom and the United States all currently use this approach, though the United Kingdom may move to an exemption system. Since taxing profits twice would put its firms at a competitive disadvantage, these countries allow companies to take a credit for taxes paid abroad. The following example illustrates how overseas tax rates and credits impact the tax obligations of a U.S.-headquartered firm.

Suppose a U.S.-based company earned $200,000 in the United States and $100,000 in Mexico. The U.S. tax rate is 35%. The firm owes $105,000 in worldwide taxes on its $300,000 pre-tax earnings. If the company paid $50,000 taxes in Mexico, it could take a credit for that amount on its U.S. tax return. This would reduce its U.S. tax obligation to $55,000.

<table>
<thead>
<tr>
<th>U.S.-based Firm</th>
<th>Worldwide Earnings</th>
<th>Mexican Subsidiary</th>
<th>Foreign Tax Credit</th>
<th>U.S. Tax Obligation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Tax Earnings</td>
<td>$300,000</td>
<td>$100,000</td>
<td>--</td>
<td>$200,000</td>
</tr>
<tr>
<td>Tax Expense/(Credit)</td>
<td>$105,000</td>
<td>$50,000</td>
<td>($50,000)</td>
<td>$55,000</td>
</tr>
<tr>
<td>Tax Rate</td>
<td>35%</td>
<td>50%</td>
<td>--</td>
<td>27.5%</td>
</tr>
</tbody>
</table>

Table 4: Foreign Tax Credits

In the above example, Mexico’s high tax rates reduced the firm’s U.S tax obligations and domestic tax rate. This potential caused the U.S. Congress to place limitations on foreign tax credits. One law limits foreign tax credits to the percentage of foreign-sourced income. Using the example above, a U.S.-based corporation would first calculate a worldwide tax obligation of $105,000, or 35% of its $300,000 in worldwide earnings. Its
foreign tax credit is limited to $35,000, which is one-third of its worldwide earnings, reflecting its foreign-sourced income. Its U.S. tax obligation is determined by subtracting the foreign tax credit of $35,000 from the $105,000 figure. Its U.S. tax obligation would be $70,000, and its worldwide tax expense would be $120,000, shown below:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings</td>
<td>$300,000</td>
<td>$100,000</td>
<td>--</td>
<td>$200,000</td>
<td>$300,000</td>
</tr>
<tr>
<td>Tax Expense/(Credit)</td>
<td>$105,000*</td>
<td>$50,000</td>
<td>($35,000)</td>
<td>$70,000**</td>
<td>$120,000***</td>
</tr>
<tr>
<td>Tax Rate</td>
<td>35%</td>
<td>50%</td>
<td>--</td>
<td>35%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Table 5: Foreign Tax Credits Limited by share of Foreign Sourced Income

* 35% of $300,000 is the estimated worldwide tax expense
** The $105,000 in estimated worldwide tax expense, less the $35,000 tax credit in column 3
*** $50,000 in Mexican income taxes plus $70,000 in U.S. taxes

This limitation created an incentive to earn foreign-sourced income and increase the foreign tax credit. Creative tax departments have found ways to do this, such as transferring cash offshore to earn interest income abroad. To limit this, a second tax credit law requires MNEs to separate earnings into several “baskets of income.” Foreign tax credits earned in one basket cannot offset tax obligations from another basket. This prevents the company from increasing foreign tax credits by shifting passive income overseas. The passive interest income may not be used to generate a tax credit for the active income, which is earned from the sale of products or services.

Thus foreign tax credits are valuable assets, and need to be earned in the right basket. In the absence of sufficient foreign tax credits, a company could pay taxes on its earnings twice, increasing its worldwide tax rate. U.S.-based firms need to monitor foreign tax credits to determine if they can defer all taxes on foreign earnings. Tax credit policies in Italy, Japan, Norway and the United Kingdom should be investigated separately.

MNEs based in tax credit countries do not permanently reduce taxes by operating in tax havens, at least in theory. As Thomas Gresik writes, “The main advantage of deferral to transnationals is the ability to avoid paying home taxes that are reinvested in the foreign
operations.” Firms defer tax payments until the subsidiary repatriates cash to the parent company. Nonetheless, due to the time value of money, deferring taxes is valuable. In addition, tax authorities sometimes temporarily reduce income tax rates on repatriated funds. This encourages cash transfers and generates tax revenue, though at a reduced rate. Knowing this, many companies defer repatriation until tax rates are temporarily reduced. For example, the American Jobs Creation Act of 2004 reduced the tax rate on repatriated funds to 5.25% for that year, which motivated U.S. firms to transfer funds to the parent. Thus, in many cases firms do not merely defer tax obligations. They permanently reduce their worldwide tax rate. For these reasons MNEs frequently organize their business activities to defer tax obligations, even if the parent country taxes worldwide earnings.

**Opportunities to Create an Income Tax Efficient Supply Chain**

Analyzing the tax consequences of supply chain management has been mentioned in academic journals, but the topic is relatively new. One article commented: “Finally, the global supply chain can take advantage of diversity in the international environment by recognizing and exploiting regional differences, i.e., in the level of product and process technology expertise, labor force capabilities, input factor costs, local tax rates, and the capabilities of off-shore vendors.” However the article did not explain how firms can pursue these opportunities. The authors said: “Effective management of the activities dispersed throughout the global supply chain can result in lower production and distribution costs via the allocation of value-adding activities to facilities, tax minimization via transfer pricing between entities operating in different tax jurisdictions, financial arbitrage via international cash flow management…” Nonetheless, the authors stated: “Analytical modeling in this field, however, is relatively new.” The articles cited at the beginning of this paper, focusing on the concerns of tax authorities, were published in 2006.

As discussed, some businesses today prefer to ignore “arbitrary geographic boundaries” when restructuring supply chains. While these boundaries may appear arbitrary, they can have a material impact on income tax obligations. Thus it is a mistake to ignore taxes.
For many companies it is their largest single expense. Supply chain analysis should explicitly consider international boundaries when they impact income tax obligations, and net income should be a key measure of supply chain success.

To determine where the best tax and supply chain planning opportunities exist, the MNE’s functional and legal model will be analyzed. The sales corporation, the distribution center, the manufacturing corporation and other entities will be analyzed in turn to determine the optimal alternatives for income tax efficient supply chain planning.

**Sales Corporations and Permanent Establishment**

When international sales are minimal, businesses frequently sell their products to trade customers through other firms. The firm can sell products to a locally-based business that imports the products and sells them to trade customers. In this situation, the MNE has no legal presence in that nation and pays no income taxes there.

As sales increase abroad, MNEs frequently hire their own employees. Salaried staff becomes more cost effective than selling through a third party. Businesses can also achieve greater business process control managing their own employees.

Crossing international boundaries requires firms to address international tax complexities. Tax treaties simplify this process. “Tax treaties are bilateral agreements between countries that provide tax relief for those persons covered by the treaties. Tax treaty provisions generally override the treatment otherwise called for under the Internal Revenue Code or foreign tax statutes.” 72 Another text states an income tax treaty “is a bilateral agreement between the governments of two countries defining and limiting each country’s respective tax jurisdiction. The treaty provisions pertain only to individuals and corporations that are residents of either country and override the countries’ general jurisdictional rules. Under a typical treaty, a firm’s income is taxable only by the country of residence (the home country) unless the firm maintains a permanent establishment in the other country (the host country).” 73
The OECD Model Treaty is frequently used to negotiate bilateral agreements and define “permanent establishment.” According to it, permanent establishment refers to “a fixed place of business through which the business of an enterprise is wholly or partly carried on.” A fixed place of business specifically includes a place of management, a branch, and office, a factory, a workshop or any site developed to extract natural resources. The OECD Model Treaty provides a number of exceptions, in general permitting organizations to conduct limited support and auxiliary activities without triggering permanent establishment and local income tax obligations. Examples cited include permitting “the use of facilities for the purpose of storage, display or delivery of goods or merchandise,” or “solely for the processing by another enterprise,” or “any other activity of a preparatory or auxiliary character.” The treaty identifies a number of similar support examples that do not constitute permanent establishment.

Permanent establishment can be created when more vital business processes are conducted locally. For example, negotiating contracts triggers permanent establishment. Specifically, the OECD Model Treaty states when a person “in a Contracting State (has) an authority to conclude contracts in the name of the enterprise, that enterprise shall be deemed to have permanent establishment in that State with respect of any activities which that person undertakes for the enterprise.” This does not apply to contracts for the support and auxiliary activities cited in the previous paragraph.

Permanent establishment definitions can differ from country to country. When definitions conflict generally for OECD members, “The treaty definition (based upon the OECD Model Treaty prevails over the definition under domestic law.” However, permanent establishment rules are being reviewed in some countries, in large part due to supply chain restructurings. To illustrate this, developments in one country, the United Kingdom, will be reviewed.

Within the United Kingdom two key issues are examined. The first is “if the principal is carrying on a business through a fixed base in the United Kingdom.” The second is “if the UK Company is a dependent agent of the principal.” If the UK Company
“habitually exercises an authority to conclude contracts in the name of the principal,” then it can be viewed as a dependent agent, and permanent establishment may be alleged. A number of issues need to be examined closely to determine the outcome. If customer credit decisions are made in the UK, this suggests permanent establishment. Companies sometimes employ a “non-contracting disclosed arrangement” to avoid permanent establishment, but tax authorities may go beyond legal agreements and examine how business is actually conducted. “In practice, drawing the dividing line between contracting and non-contracting is not always simple. HMRC is likely to argue that having the principal actually ‘sign’ the contracts with customers may not be sufficient if all they do in reality is rubber stamp the terms and conditions including price, discounts etc. that have already been ostensibly agreed to by the local agent.” Ultimately the key issues are whether the UK organization is accepting risk and making key business decisions, not only contractually, but in practice. When risk is assumed or business decisions are made within the United Kingdom, it is more likely that UK tax authorities will assert permanent establishment. But all of the facts and circumstances are evaluated by tax authorities, and judgment is applied, especially in light of supply chain restructurings that test the law’s limits. Developments in other countries should be investigated separately.

Tax impact is more difficult to determine when bilateral tax treaties do not exist. One tax text says: “If a U.S. firm conducts any business in a country that does not have an income tax treaty with the United States, the host country’s jurisdiction depends on its unique tax laws.” In the absence of a tax treaty, the firm needs to research the local tax laws. “This determination is often subjective and results in considerable uncertainty for the firm. Moreover, the requisite level of business activity in non-treaty countries is often much less than the maintenance of a permanent establishment in the country.” For these reasons firms find it is easier to expand into countries in which tax treaties exist.

Whether or not the MNE forms an overseas sales corporation, MNEs frequently expand into new markets to increase sales and profits. For technologically-advanced products, demand is strongest in the most industrialized countries. Developed countries also
impose relatively high corporate income taxes. As a result, sales corporations are poor opportunities to improve profits through an income tax efficient supply chain. There are no simple ways expand into large, prosperous markets and keep taxes low.

To demonstrate this, consider the population, GDP and income tax rate of G-7 countries, which are some of the world’s largest economies. While these are some of the world’s strongest markets, the tax rates are substantially higher than in many tax havens, to be shown subsequently. The following table shows these figures for each G-7 country:

<table>
<thead>
<tr>
<th>Country</th>
<th>Population (000 omitted)</th>
<th>GDP (in million $)</th>
<th>Per Capita GDP</th>
<th>Max. Corporate Tax Rate—2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.A.</td>
<td>301,110</td>
<td>$10,320.6</td>
<td>$34,275</td>
<td>39.3%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>60,776</td>
<td>1,530.27</td>
<td>$25,179</td>
<td>30.0%</td>
</tr>
<tr>
<td>Canada</td>
<td>33,390</td>
<td>767.14</td>
<td>$22,975</td>
<td>36.1%</td>
</tr>
<tr>
<td>France</td>
<td>63,713</td>
<td>1,382.76</td>
<td>$21,703</td>
<td>34.4%</td>
</tr>
<tr>
<td>Germany</td>
<td>82,401</td>
<td>1,925.87</td>
<td>$23,272</td>
<td>38.9%</td>
</tr>
<tr>
<td>Italy</td>
<td>58,148</td>
<td>1,100.71</td>
<td>$18,929</td>
<td>33.0%</td>
</tr>
<tr>
<td>Japan</td>
<td>127,433</td>
<td>4,803.20</td>
<td>$37,692</td>
<td>39.54%</td>
</tr>
</tbody>
</table>

Table 6: G-7 Population, GDP and Corporate Income Tax Rates

High tax rates rarely discourage companies from selling products in these populous and wealthy countries. For example, if strong Japanese demand exists for a company’s products, a 40% tax rate is unlikely to prevent market entry. As long as marginal revenue exceeds marginal cost the sales are profitable, despite the relatively high share due the Japanese government. Avoiding the large Japanese market or selling through Japanese companies may be financially unattractive alternatives.

A few companies have successfully bypassed local sales corporations and sold products from another jurisdiction. They need to avoid permanent establishment to do this. In most industries this is not possible, as it is essential to have local sales and service organizations there. But other business models are possible. One article described how Microsoft does this:

“Microsoft and others are now going further. Microsoft delivers its Windows products to European customers straight from Ireland, and the profits go straight back to Ireland. Since most of the profits from Microsoft programs are in the form of copyright licensing fees, ‘it is
likely that low or nil taxes are payable in the other EU states,’ says John Ward, a tax professor at the University of Ulster in Belfast, Northern Ireland.” 94

The article notes: “To avoid U.K. corporate-profits tax, a company must show it has no ‘permanent establishment’ in Britain through which it makes sales” 95 Microsoft has structured its activities to shift risk and revenue recognition to its Irish subsidiary. The precise details concerning how they have done this are not publicly available. But software firms can distribute products and provide support over the Internet, creating opportunities not available in other industries. “Microsoft’s ability to avoid reporting large profits in the United Kingdom relies on its position that its U.K. sales -- $1.8 billion in fiscal 2004 -- are actually conducted from Ireland.”96

Organizations within an MNE must collaborate to make this work successfully. Software firms may be able to do this more successfully than others, in large part due to the ease of Internet distribution and product support. But if the selling agent can avoid permanent establishment, it should be considered. To accomplish this, product marketing needs to determine whether they can sell and support products successfully without a local presence. Legal departments need to do an in-depth examination of permanent establishment laws. The tax department can analyze the tax impact. And supply chain organizations can quantify manufacturing and distribution costs.

**Distribution Centers**

Distribution centers receive finished goods from manufacturing corporations, and later deliver products to sales corporations. They add value by reducing the number of delivery nodes between manufacturing organizations and retail customers, by consolidating storage, and by efficiently delivering customer goods promptly.

Companies do not need distribution centers in each country the firm sells products. The enterprise can thus determine how many are needed by focusing upon customer requirements and cost management. Companies frequently centralize distribution
activities to achieve economies of scale. Many MNEs create regional distribution centers to service several countries. For example, “Many firms in Europe rely on one or a few distribution centers servicing all customers within a time window of 24-72 hours, depending upon the location of customers.” Centralization strategies may create an opportunity to create a tax efficient supply chain.

If the parent-country exempts foreign earnings from domestic taxation distribution centers may be good opportunities to link supply chain and income tax analysis. MNEs can permanently avoid domestic income taxes, and parent-country tax laws do not restrict distribution centers. Economic efficiency can determine the number of distribution centers, not legal requirements. To analyze the opportunity, the supply chain organization can calculate operational and distribution costs. The tax department can project transfer prices and calculate tax benefits. Together they can project distribution center net income in various locations, and recommend the best location.

However when the parent-country taxes worldwide earnings, tax laws should be reviewed closely. For example, U.S. tax laws limit distribution center opportunities. As mentioned, the U.S. taxes worldwide earnings, permits tax credits, and defers domestic taxation until a firm repatriates funds. However tax laws deny deferral in certain situations. U.S. tax code “Subpart F” requires immediate taxation of certain Controlled Foreign Corporations (CFCs). As noted in one tax text:

“No all foreign source income earned by a CFC must be constructively repatriated to its U.S. shareholders. Only narrowly defined categories of income (labeled Subpart F income in the Internal Revenue Code) are treated as constructive dividends. Conceptually, Subpart F income is artificial income because it has no commercial or economic connection to the CFC’s home country. Subpart F has many complex components, one of the more important of which is income derived from the sale of goods if (1) the CFC either buys the goods from or sells the goods to a related party and (2) the goods are neither manufactured nor sold for use within the CFC’s home country.”

Thus Subpart F may apply to certain distribution centers. CFCs purchasing products from other countries and selling them to related parties abroad are subject to Subpart F. It
requires immediate taxation of overseas earnings; deferral is not permitted. If the U.S. tax rate is higher than the local tax rate the difference between the two cannot be deferred, and is owed to the U.S. treasury.

However not all distribution centers are subject to Subpart F. It does not apply when a distribution center is located in the same country the company either builds or sells products. As an example, suppose a firm manufactures products in Singapore, and needs to form a Southeast Asia distribution center. Subpart F would not apply to a Singapore-based distribution center, as the distribution center would purchase products within that country. The low Singapore tax rate would apply. Locating the distribution center in a third country could increase the tax rate from 18% (Singapore’s rate) to 35% (the U.S. Federal rate). The MNE should weigh these savings against supply chain costs and other business objectives.

Similar laws in other tax credit countries (Italy, Japan, Norway, and the United Kingdom) should be investigated separately. However the issues posed by U.S. tax law demonstrate that to maximize net income, supply chain and tax organizations should collaborate.

**Manufacturing Corporations**

As demonstrated, sales companies show limited potential to create a tax efficient supply chain. Most businesses need a local presence to sell their goods and services, which triggers permanent establishment and local income tax obligations. Tax rates are comparatively high in the developed countries. While Microsoft’s Irish sales strategy has been very successful, few businesses can sell and support products without a local presence.

Distribution centers can be attractive opportunities to integrate supply chain and tax planning, particularly if the parent country exempts earnings from domestic taxation. However in some tax credit countries, such as the United States, tax laws do not permit
deferral in many situations. Close attention to international tax laws is required when the parent-countries tax worldwide earnings.

Manufacturing corporations may be the best opportunity to integrate supply chain and tax planning. To achieve economies of scale, most businesses prefer to concentrate manufacturing resources and limit the number of manufacturing sites. This makes manufacturing site selection very important. Many factors motivate manufacturing site location, including local wage rates, employee skill sets, inbound and outbound logistics costs, access to materials and parts, proximity to customers, transportation services, the local regulatory environment, political stability, and income tax rates. In addition, manufacturing corporations do not face the Subpart F limits facing distribution centers. Manufacturing products requires technology, skills and fixed assets, thus creating business substance international tax laws generally support. As a result, MNEs frequently designate the manufacturing corporation the profit center for residual or superior earnings. One organization often takes the most risk in a Multi-National Enterprise, and earns superior rates of return when the business does well. It absorbs losses when the business performs poorly. Other entities frequently accept less risk, and earn modest but consistent returns for services performed, whether the entire business succeeds or struggles.

To illustrate this, suppose a MNE manufactures products in one country, distributes them in a second, and sells products in a third. Furthermore, this business consistently earns superior rates of return, akin to the high earnings earned by Microsoft’s operating system business. The business must establish transfer prices to achieve arms-length results. The MNE can structure its transfer pricing so the sales corporation and distribution centers earn adequate profits. The earnings must be sufficient to satisfy tax authorities, who compare results with many trade businesses performing similar functions, few of which are so successful. The income need not be above average, simply because the entire business is very profitable. The manufacturing corporation realizes the superior profits and also accepts the risk of loss, should the business perform poorly.
Describing a similar structure, one article commented:

“Similarly, a foreign affiliate engaged in manufacturing often will earn returns not only for the underlying manufacturing activity—which is essentially a service—but also for the risks associated with owning raw materials, work-in-process, and other inventory. It will also earn returns for its manufacturing know-how in the form of proprietary processes. Here again, the economic returns ascribed to the assumption of risks and ownership of assets and intangibles can result in the foreign affiliate earning a significant level of income…” \(^\text{101}\)

Some countries seek to attract manufacturing, and offer low tax rates to attract businesses there. Often these countries are relatively small, and low tax rates attract jobs and improve the local economy. Singapore, Ireland and Puerto Rico are all small jurisdictions offering low tax rates to attract manufacturing activities. Lowering tax rates can actually increase government revenue, as the additional taxes paid by a few major employers can offset broad tax reductions. More importantly lower tax rates generate jobs with a multiplier effect, as support activities increase to supply necessary services. The following table shows the population, GDP, and tax rates in those popular tax havens:

<table>
<thead>
<tr>
<th>Location</th>
<th>Population (000 omitted)</th>
<th>Gross Domestic Product (in billion dollars)</th>
<th>Per Capita GDP</th>
<th>Corporate Tax Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>4,109</td>
<td>110.74</td>
<td>$26,951</td>
<td>12.5% (^\text{102})</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>3,944</td>
<td>67.71</td>
<td>$17,168</td>
<td>2-7% (^\text{103})</td>
</tr>
<tr>
<td>Singapore</td>
<td>4,533(^\text{104})</td>
<td>94.51(^\text{105})</td>
<td>$20,849</td>
<td>18% (^\text{106})</td>
</tr>
</tbody>
</table>

Table 7: Population, GDP and tax rates in selected tax havens

Puerto Rico’s tax rate can drop as low to zero for businesses granted “pioneer status,” which are desirable businesses that promote a highly-educated workforce. \(^\text{107}\) Singapore also negotiates tax rates for attractive businesses, so tax rates there are frequently well below 18% when they are granted pioneer status there. Other countries, such as Malaysia and a number of countries in Eastern Europe also offer low income tax rates, and some will negotiate reductions on a case-by-case basis, to attract certain firms and industries.
The MNE and tax haven may both benefit. The business can substantially reduce its tax obligations by shifting operations to a country with low tax rates. The tax haven attracts jobs, develops the local economy, and may actually increase tax revenue. When the country’s population is small, the tax revenue can be significant. Microsoft’s taxes paid one year in Ireland amounted to $77 for each citizen. Corporate taxes account for nearly half of Ireland’s tax revenues, while only 5-10% of government tax revenue in Germany, France and the United Kingdom.

Thus MNEs frequently organize their business to locate their most profitable organization in tax havens, such as Singapore, Ireland and Puerto Rico. The manufacturing corporation and/or intellectual property owner is frequently that activity. To align risk and reward and support their tax strategy, the more profitable legal organization accepts the most business risk.

This structure creates an opportunity to earn superior rates of return in low-tax locations. The high returns earned by the manufacturing corporation or intellectual property owner are not visible to tax authorities in other jurisdictions. Furthermore, their governments have no legal claim to profits recognized by the risk-taking organization. Tax authorities in the residual profit center enjoy the earnings recognized and taxes paid there.

**Procurement Organizations and Shared Service Centers**

As previously discussed, historically MNEs created autonomous overseas subsidiaries, responsible many business processes. More recently MNEs have restructured supply chains to centralize business processes where they can be performed most efficiently. The Journal of Supply Chain Management reports MNEs are forming International Procurement Offices (IPOs) to specialize in purchasing necessary parts and materials, to achieve economies of scale and improve their procurement cost structure. For example, in the United Kingdom “There has been an increased tendency for groups to centralize their purchasing activity and pool a group’s purchasing power. Potential procurement savings often quoted can range from 5% to 20%, depending on industries
and a group’s starting point.” Cost savings are achieved through: “better negotiations, volume, improved relationships with suppliers and well coordinated logistics from better order and delivery processes.” Belgium has also attracted international procurement organizations.

Centralization strategies differ from company to company, depending upon unique business needs. But frequently procurement organizations manage this activity for several international sites. As an example, a company could have one procurement organization for the U.S., another for Europe, and a third in Southeast Asia. The IPO can produce cost savings while supporting local needs.

IPOs are an opportunity to link the supply chain and tax planning. IPOs need to recover their costs and operate profitably, so they sell goods and services to related parties at arms-length prices. Firms should consider tax ramifications when locating that activity. As one article noted, “Linking these two concepts, it is possible for companies to centralize their procurement functions, proprietary procurement processes, and know-how into specific corporate entities in low-tax jurisdictions. These ‘procurement companies,’ are entitled, from a tax perspective, to charge other corporate entities an arm’s length amount for the value-added procurement activities undertaken on their behalf.” A graphical depiction follows:
Note: The IPO leverages its purchasing power to reduce costs of parts and materials from external suppliers. It charges an arms-length transfer price to organizations within the same MNE.

Figure 3: International Procurement Organizations

Once again, MNEs need to investigate the parent country’s relevant tax laws. If the parent country exempts foreign subsidiaries from domestic taxation, the procurement offices can reduce the enterprise’s worldwide tax rate. But this may not be possible if the parent country taxes worldwide earnings. Within the United States, Subpart F governs IPO tax obligations in certain situations. If the IPO is located in the same country it purchases goods or sells goods, the local income tax rate applies. But if the IPO is located in a third country, in which the firm neither buys nor sell goods, the U.S. rate applies. This is relevant if the MNE operates in a tax haven. For example, if a U.S.-parent company manufactured goods in Ireland, and formed an IPO there, the local tax rate would apply. Locating the IPO in a country where it had no operations could trigger
Subpart F and the 35% U.S. federal tax rate. The firm would still pay local taxes and take a tax credit, but the difference between the worldwide and local tax rate would be owed to the U.S. Treasury.\textsuperscript{116}

Compensation for centralized purchasing is likely to be a cost-plus markup. It may be difficult to obtain comparable prices for such procurement services. While independent parties procure goods for clients, they frequently assume more risk than internal purchasing organizations. “Group central purchasers, will, however, often not perform functions or assume risks that are similar to many independent parties, as for example, commercial risks may differ.”\textsuperscript{117} OECD Guidelines suggest cost-plus compensation is most appropriate when comparable transactions cannot be identified. “In the absence of uncontrolled comparables and assuming that the central purchaser’s involvement is that of order centralization without an entrepreneurial role, it is likely to receive remuneration based on a cost-plus methodology,”\textsuperscript{118} according to one article.

In addition to IPOs, MNEs have centralized other activities to provide support across international boundaries. One article stated: “This occurs for a variety of reasons, e.g. cost reduction strategies that result in centralization of regional support functions…”\textsuperscript{119} Centralized business processes include “various regional support functions such as finance, marketing, information technology (IT) and human resources (HR).”\textsuperscript{120} For example, the MNE might centralize certain accounting functions, such as payroll, accounts receivable collections, or accounts payable. Or it might create a regional information technology center, to meet the IT needs in a number of countries. These organizations are also logical candidates for integrated supply chain and tax planning, and they do not face Subpart F restrictions, which focus primarily upon goods movements. Similar to the IPOs, these organizations are likely to charge a cost-plus markup for their services, if they are not unable to find comparable organizations providing similar services and taking comparable business risks.
Case Study: The Pharmaceuticals Industry

The argument for supply chain and income tax collaboration appears to be very strong. For many firms income taxes are one of their largest expenses. Net income and after-tax cash flow drive shareholder value, not pre-tax figures. Tax departments and supply chain organizations both recommend where to locate business operations. These organizations should collaborate to make optimal location decisions. Supply chain organizations should aim to improve net income, and they cannot accomplish that without tax department advice. Are there industries that do this today?

The pharmaceutical’s industry has a substantial manufacturing presence in several tax havens, which will be demonstrated subsequently. Some argue that its high profit margins and low distribution costs lead it to manufacture there. For example, in his 1993 paper “Pricing, Profits and Technological Progress in the Pharmaceutical Industry,” Harvard Professor F.M. Scherer wrote: “Because drug manufacturing and transportation costs are modest in relation to product prices and because the geographic locus of patent rights ownership is easily transferred, the pharmaceutical companies have been particularly aggressive in obtaining U.S. federal income tax credits by locating their production operations in Puerto Rico.”¹²¹ Scherer’s knowledge of the pharmaceutical industry was drawn from his experience as chair of a U.S. Office of Technology Assessment advisory committee on pharmaceutical R&D.¹²²

Professor Scherer’s comments merit more detailed examination for several reasons. Not only do they explain the pharmaceutical industry’s substantial presence in Puerto Rico, they may have broader application. First, Scherer notes that pharmaceutical manufacturing costs are low when compared to products prices. From an accounting perspective, this means the pharmaceutical industry earns high gross margins. When profit margins are high, low income tax rates become increasingly valuable, and have a larger impact upon net earnings. Thus highly profitable firms may have an added incentive to seek low income tax rates. Second, Scherer notes that the pharmaceutical industry’s transportation costs are low when compared to product prices. Transportation
(or distribution) costs can be important for several reasons. To achieve earnings objectives firms want to control distribution costs, like any other cost. But firms may scrutinize distribution costs more closely if they are considering moving operations to a low tax region, since transferring operations abroad can extend the supply chain and increase a firm’s distribution costs. Thus a firm seeking low tax rates may need to balance income tax savings against increased supply chain costs. Finally, Scherer believes the ease with which intellectual property can be transferred creates opportunities to reduce income taxes. Together these factors were instrumental in the development of Puerto Rico’s pharmaceutical industry. If these drove the pharmaceutical industry’s decision to manufacture products in Puerto Rico, these factors may motivate businesses with similar cost characteristics to take similar actions.

**Profit Margins and Tax Rates**

While many MNEs should consider supply chain and tax integration, not all businesses will realize similar benefits. Scherer argues the pharmaceuticals industry’s high margins were factors in its decision to manufacture in Puerto Rico. This is because highly profitable firms save more taxes than firms with low profit margins.

The following examples compare the tax savings for two firms. In the first example, a company has high gross and pre-tax profit margins, and is considering manufacturing in a low-tax jurisdiction. Cost of sales is 15% of the trade price, and its transfer price is 75% of the trade price.

<table>
<thead>
<tr>
<th>High Gross Margin Co.</th>
<th>Option One: Manufacturing in high tax region (35% rate)</th>
<th>Option Two: Manufacturing in low tax region (10% rate)</th>
<th>Financial Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade Price</td>
<td>$1,000</td>
<td>$1,000</td>
<td>--</td>
</tr>
<tr>
<td>Transfer Price</td>
<td>$750</td>
<td>$750</td>
<td>--</td>
</tr>
<tr>
<td>COGS</td>
<td>$150</td>
<td>$150</td>
<td>--</td>
</tr>
<tr>
<td>Gross Margin</td>
<td>$600</td>
<td>$600</td>
<td>--</td>
</tr>
<tr>
<td>Local SG&amp;A</td>
<td>$50</td>
<td>$50</td>
<td>-</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>$550</td>
<td>$550</td>
<td>--</td>
</tr>
<tr>
<td>Taxes</td>
<td>$193</td>
<td>$55</td>
<td>($138)</td>
</tr>
<tr>
<td>Net Profit</td>
<td>$357</td>
<td>$495</td>
<td>$138</td>
</tr>
</tbody>
</table>
The firm saves $138 by manufacturing products in a low-tax jurisdiction.

Contrast this with the gains for a firm earning lower profit margins. For this firm, cost of sales is 55% of revenue, and all other figures are the same as the prior example, except income taxes. As the transfer price is sufficient to fund overseas sales, the enterprise’s gross margin and operating profit is lower than the prior firm’s.

<table>
<thead>
<tr>
<th>Low Gross Margin Co.</th>
<th>Option One: Manufacturing in high tax region (35% rate)</th>
<th>Option two: Manufacturing in low tax region (10% rate)</th>
<th>Financial Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade Price</td>
<td>$1,000</td>
<td>$1,000</td>
<td>--</td>
</tr>
<tr>
<td>Transfer Price</td>
<td>$750</td>
<td>$750</td>
<td>--</td>
</tr>
<tr>
<td>COGS</td>
<td>$500</td>
<td>$500</td>
<td>--</td>
</tr>
<tr>
<td>Gross Margin</td>
<td>$250</td>
<td>$250</td>
<td>--</td>
</tr>
<tr>
<td>Local SG&amp;A</td>
<td>$50</td>
<td>$50</td>
<td>--</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>$200</td>
<td>$200</td>
<td>--</td>
</tr>
<tr>
<td>Taxes</td>
<td>$70</td>
<td>$20</td>
<td>($50)</td>
</tr>
<tr>
<td>Net Profit</td>
<td>$130</td>
<td>$180</td>
<td>$50</td>
</tr>
</tbody>
</table>

Its tax savings are only $50, due to the lower profit margins.

Thus the firm with higher profit margins saves more tax dollars than the firm with low profit margins. Highly profitable firms stand to gain more from reduced tax rates than less profitable businesses. As such, high profit margin industries have added incentive to locate in tax havens.

**The Pharmaceutical Industry’s Profit Margins**

Not only do firms with high profit margins gain more from low tax rates, they can frequently allocate more profit to their manufacturing corporation, which can be located in a low tax jurisdiction. This can be done more successfully if both gross and pre-tax profit margins are also above average. The more profit a company has to apportion, the more it can allocate to a low tax jurisdiction.
The pharmaceuticals industry consistently earns high profit margins. A number of studies conducted over the last thirty years have demonstrated its earnings are well above average. For example, in 1977 economist Walter Measdy conducted an analysis of the pharmaceutical industry’s profits during the 1960’s and 1970’s. He wrote: “During the entire period, the annual rates of return for all manufacturing averaged 11.0 percent, compared to 18.1 percent for the drug industry and 19.7 percent for the 12 large companies. Furthermore…there has been relatively less variation in drug industry profits than in all manufacturing.”\textsuperscript{123} In short, not only did the pharmaceutical industry earn higher profit margins, its returns were also more consistent.

Professor Scherer’s 1993 paper again demonstrated the high profit margins in the pharmaceutical industry. He wrote:

“They are an extraordinary characteristic of the pharmaceutical industry has been its extraordinarily high reported profitability. Between 1960 and 1991, pharmaceuticals held first or second rank in 24 years out of 32 on Fortune magazine’s annual tabulation of median after-tax profit returns on stockholder’s equity for its 500 largest industrial corporations, classified into between 21 to 28 industry categories. On average, over the 32-year period, the return on stockholder’s equity for pharmaceuticals was 18.4 percent, compared to 11.9 percent for all 500 industrials.”\textsuperscript{124}

Another analysis compared the pharmaceuticals industry’s profits with the earnings of manufacturing firms. The article analyzed after-tax return on assets for four industries, and compared the results with a group of manufacturing firms. The pharmaceuticals industry’s return on assets was 14.81%, versus an average of 7.5% for the other manufacturing industries.\textsuperscript{125} Since the 1960’s the pharmaceutical industry’s profit margins have been well above average, as shown in a variety of profit metrics.

The pharmaceuticals industry’s success has also prompted interest in why its returns are so high. Some research has focused upon whether accounting information accurately reflects underlying economic substance. Scherer writes: “The persistently high profit returns reported by the pharmaceutical company financial statements have provoked both debate and frontier-extending research on the limitations of accounting data.”\textsuperscript{126}
As all of these studies were written more than ten years ago, a more current analysis of the pharmaceutical’s industry’s profit rates was conducted for this paper to determine if these conclusions are still valid. The financial statements for twenty of the largest pharmaceutical firms trading on either the New York Stock Exchange or NASDAQ were compiled from publicly available information published by the U.S. Securities and Exchange Commission (SEC). Annual financial information for the most recent three years was collected and averaged, to minimize potential distortions from one time gains or losses. This information again showed the pharmaceuticals industry earns superior rates of return. Pharmaceuticals industry information is displayed below:

<table>
<thead>
<tr>
<th>20 Pharm. Co’s.</th>
<th>Company Name</th>
<th>Revenue (000 omitted)</th>
<th>Cost of Goods Sold</th>
<th>Gross Margin</th>
<th>Gross Margin %</th>
<th>Pre-Tax Profit</th>
<th>Pre-Tax Profit %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Johnson and Johnson</td>
<td>50,935</td>
<td>14,144</td>
<td>36,251</td>
<td>71.9%</td>
<td>13,265</td>
<td>27.0%</td>
</tr>
<tr>
<td>2</td>
<td>Pfizer</td>
<td>50,732</td>
<td>7,902</td>
<td>42,880</td>
<td>84.4%</td>
<td>12,856</td>
<td>25.3%</td>
</tr>
<tr>
<td>3</td>
<td>GlaxoSmithKline</td>
<td>40,665</td>
<td>8,772</td>
<td>31,894</td>
<td>78.4%</td>
<td>10,262</td>
<td>25.2%</td>
</tr>
<tr>
<td>4</td>
<td>Novartis</td>
<td>36,074</td>
<td>10,066</td>
<td>26,008</td>
<td>72.1%</td>
<td>7,432</td>
<td>20.6%</td>
</tr>
<tr>
<td>5</td>
<td>Sanofi-Aventis</td>
<td>31,077</td>
<td>8,032</td>
<td>23,045</td>
<td>74.2%</td>
<td>1,522</td>
<td>4.9%</td>
</tr>
<tr>
<td>6</td>
<td>AstraZeneca</td>
<td>24,122</td>
<td>5,415</td>
<td>18,713</td>
<td>77.6%</td>
<td>5,367</td>
<td>22.2%</td>
</tr>
<tr>
<td>7</td>
<td>Merck and Co.</td>
<td>22,528</td>
<td>5,370</td>
<td>17,158</td>
<td>76.2%</td>
<td>7,187</td>
<td>31.9%</td>
</tr>
<tr>
<td>8</td>
<td>Abbott Laboratories</td>
<td>21,498</td>
<td>9,780</td>
<td>11,718</td>
<td>54.5%</td>
<td>3,674</td>
<td>17.1%</td>
</tr>
<tr>
<td>9</td>
<td>Wyeth</td>
<td>18,822</td>
<td>5,322</td>
<td>13,500</td>
<td>71.7%</td>
<td>3,360</td>
<td>17.9%</td>
</tr>
<tr>
<td>10</td>
<td>Bristol-Myers Squibb</td>
<td>18,834</td>
<td>5,958</td>
<td>12,876</td>
<td>68.4%</td>
<td>3,856</td>
<td>20.5%</td>
</tr>
<tr>
<td>11</td>
<td>Eli Lilly &amp; Co.</td>
<td>14,731</td>
<td>3,415</td>
<td>11,317</td>
<td>76.8%</td>
<td>3,026</td>
<td>20.5%</td>
</tr>
<tr>
<td>12</td>
<td>Amgen</td>
<td>12,416</td>
<td>1,969</td>
<td>10,447</td>
<td>84.1%</td>
<td>4,094</td>
<td>33.3%</td>
</tr>
<tr>
<td>13</td>
<td>Schering-Plough</td>
<td>9,458</td>
<td>3,371</td>
<td>6,087</td>
<td>64.4%</td>
<td>604</td>
<td>6.4%</td>
</tr>
<tr>
<td>14</td>
<td>Baxter International</td>
<td>9,912</td>
<td>5,664</td>
<td>4,248</td>
<td>42.9%</td>
<td>1,207</td>
<td>12.2%</td>
</tr>
<tr>
<td>15</td>
<td>Genentech</td>
<td>6,846</td>
<td>955</td>
<td>5,891</td>
<td>86.1%</td>
<td>2,211</td>
<td>32.3%</td>
</tr>
<tr>
<td>16</td>
<td>Teva Pharmaceuticals</td>
<td>6,152</td>
<td>3,160</td>
<td>2,993</td>
<td>48.6%</td>
<td>873</td>
<td>14.2%</td>
</tr>
<tr>
<td>17</td>
<td>Novo Nordisk</td>
<td>5,844</td>
<td>1,543</td>
<td>4,301</td>
<td>73.6%</td>
<td>1,382</td>
<td>23.6%</td>
</tr>
<tr>
<td>18</td>
<td>Alcon</td>
<td>4,393</td>
<td>1,125</td>
<td>3,268</td>
<td>74.4%</td>
<td>1,315</td>
<td>29.9%</td>
</tr>
<tr>
<td>19</td>
<td>Genzyme</td>
<td>2,708</td>
<td>653</td>
<td>2,055</td>
<td>75.9%</td>
<td>264</td>
<td>9.8%</td>
</tr>
<tr>
<td>20</td>
<td>Gilead Sciences</td>
<td>2,126</td>
<td>287</td>
<td>1,840</td>
<td>86.5%</td>
<td>393</td>
<td>18.5%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>389,340</td>
<td>102,902</td>
<td>286,438</td>
<td>73.6%</td>
<td>84,500</td>
<td>21.7%</td>
</tr>
</tbody>
</table>

Table 10: 2004-2006 Average Financial Performance of 20 Pharmaceutical Firms
The same information was collected for 22 of the 30 firms listed in the Dow Jones Industrial Average (DJIA). Pharmaceutical firms Johnson and Johnson, Merck, and Pfizer were not included. Five service firms were also excluded, as product sales comprise an insignificant portion of their sales, and cost of sales comparisons not possible. Four of these were financial services firm (American Express, American International Group, Citigroup, and JPMorgan Chase) and one is in the entertainment industry (Walt Disney). Financial information for the most recent three years was collected, and again averaged, to minimize the impact of one time gains or losses.

<table>
<thead>
<tr>
<th>Name</th>
<th>Revenue (000 omitted)</th>
<th>Cost of Goods Sold</th>
<th>Gross Margin</th>
<th>Gross Margin %</th>
<th>Net Profit</th>
<th>Pre-Tax Profit %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 3M Corporation</td>
<td>21,367</td>
<td>10,684</td>
<td>10,683</td>
<td>50.0%</td>
<td>5,054</td>
<td>23.7%</td>
</tr>
<tr>
<td>2 Alcoa</td>
<td>26,475</td>
<td>20,882</td>
<td>5,593</td>
<td>21.1%</td>
<td>2,535</td>
<td>9.6%</td>
</tr>
<tr>
<td>3 Altria</td>
<td>96,290</td>
<td>64,622</td>
<td>31,668</td>
<td>32.9%</td>
<td>16,003</td>
<td>16.6%</td>
</tr>
<tr>
<td>4 AT&amp;T</td>
<td>49,217</td>
<td>27,124</td>
<td>22,093</td>
<td>44.9%</td>
<td>7,500</td>
<td>15.2%</td>
</tr>
<tr>
<td>5 Boeing</td>
<td>55,869</td>
<td>46,987</td>
<td>8,882</td>
<td>15.9%</td>
<td>2,655</td>
<td>4.8%</td>
</tr>
<tr>
<td>6 Caterpillar</td>
<td>36,036</td>
<td>26,176</td>
<td>9,860</td>
<td>27.4%</td>
<td>3,823</td>
<td>10.6%</td>
</tr>
<tr>
<td>7 Coca-Cola</td>
<td>23,051</td>
<td>7,999</td>
<td>15,052</td>
<td>65.3%</td>
<td>6,497</td>
<td>28.2%</td>
</tr>
<tr>
<td>8 DuPont</td>
<td>28,489</td>
<td>20,186</td>
<td>8,304</td>
<td>29.1%</td>
<td>2,766</td>
<td>9.7%</td>
</tr>
<tr>
<td>9 Exxon Mobil</td>
<td>348,783</td>
<td>196,601</td>
<td>152,182</td>
<td>43.6%</td>
<td>56,025</td>
<td>16.1%</td>
</tr>
<tr>
<td>10 General Electric</td>
<td>154,738</td>
<td>67,561</td>
<td>87,177</td>
<td>56.3%</td>
<td>19,936</td>
<td>12.9%</td>
</tr>
<tr>
<td>11 General Motors</td>
<td>197,823</td>
<td>165,224</td>
<td>32,599</td>
<td>16.5%</td>
<td>3,100</td>
<td>1.6%</td>
</tr>
<tr>
<td>12 Hewlett-Packard</td>
<td>90,004</td>
<td>71,333</td>
<td>18,671</td>
<td>20.7%</td>
<td>6,558</td>
<td>7.3%</td>
</tr>
<tr>
<td>13 Home Depot</td>
<td>81,814</td>
<td>54,636</td>
<td>27,178</td>
<td>33.2%</td>
<td>8,833</td>
<td>10.8%</td>
</tr>
<tr>
<td>14 Honeywell</td>
<td>28,207</td>
<td>22,059</td>
<td>6,148</td>
<td>21.8%</td>
<td>2,267</td>
<td>8.0%</td>
</tr>
<tr>
<td>15 Intel</td>
<td>36,139</td>
<td>15,801</td>
<td>20,338</td>
<td>56.3%</td>
<td>10,032</td>
<td>27.8%</td>
</tr>
<tr>
<td>16 IBM</td>
<td>92,950</td>
<td>55,997</td>
<td>36,953</td>
<td>39.8%</td>
<td>12,520</td>
<td>13.5%</td>
</tr>
<tr>
<td>17 McDonald’s</td>
<td>20,161</td>
<td>6,311</td>
<td>13,850</td>
<td>68.7%</td>
<td>3,880</td>
<td>19.2%</td>
</tr>
<tr>
<td>18 Microsoft</td>
<td>45,064</td>
<td>8,181</td>
<td>36,883</td>
<td>81.8%</td>
<td>18,330</td>
<td>40.7%</td>
</tr>
<tr>
<td>19 Proctor &amp; Gamble</td>
<td>67,146</td>
<td>32,538</td>
<td>34,608</td>
<td>51.5%</td>
<td>12,521</td>
<td>18.6%</td>
</tr>
<tr>
<td>20 United Technologies</td>
<td>42,666</td>
<td>30,965</td>
<td>11,701</td>
<td>27.4%</td>
<td>4,761</td>
<td>11.2%</td>
</tr>
<tr>
<td>21 Verizon</td>
<td>76,315</td>
<td>27,454</td>
<td>48,861</td>
<td>64.0%</td>
<td>8,905</td>
<td>11.7%</td>
</tr>
<tr>
<td>22 Wal-Mart</td>
<td>317,431</td>
<td>241,445</td>
<td>75,986</td>
<td>23.9%</td>
<td>17,387</td>
<td>5.5%</td>
</tr>
<tr>
<td>Total</td>
<td>1,936,037</td>
<td>1,222,768</td>
<td>715,269</td>
<td>36.9%</td>
<td>231,888</td>
<td>12.0%</td>
</tr>
</tbody>
</table>

Table 11: 2004-2006 Average Financial Performance of 22 DJIA Firms
To summarize, for the most recent three years, the gross profit margin averaged 73.6% for the pharmaceutical industry, versus 36.9% for the selected Dow Jones Industrial Average firms. Pre-tax profit averaged 21.7% for pharmaceutical firms, versus 12.0% for the 22 DJIA companies. Pharmaceuticals gross profit margin and pre-tax margin are nearly twice as large as the selected DJIA firms.

**Distribution and Logistics Costs**

As mentioned previously, businesses consider many factors when determining where to locate manufacturing operations. These include many cost considerations, access to suppliers and customers, the wages and skill sets of potential employees, political stability, the location’s infrastructure and its support services. To illustrate cost trade-offs a firm may consider when developing an income tax efficient supply chain, this paper will focus on one important cost consideration: the cost of distributing products to customers. Focusing on this cost does not mean it is the only important cost consideration. Distribution and logistics costs will be the focus for the following reasons:

- Professor Scherer argued the pharmaceuticals industry’s low transportation (or distribution) costs were an important consideration in that industry’s decision to locate manufacturing operations in Puerto Rico. To analyze the merit of Scherer’s comments, this cost needs to be analyzed in more detail.
- As will be demonstrated later, many U.S.-headquartered pharmaceutical firms have located manufacturing operations to Puerto Rico. Pharmaceuticals firms did not originate operations in Puerto Rico; the industry grew through foreign direct investment. Today more than 70% of Puerto Rico’s pharmaceutical products are shipped to the United States, and only 12% are destined for Puerto Rico or nearby locations. Moving manufacturing operations to Puerto Rico located these factories away from its customer base, increasing transportation and distribution costs, and creating language, time zone, and delivery obstacles.
While distribution costs increased, the firm obtained lower tax rates by transferring manufacturing activities to Puerto Rico. Scherer pointed out the tax benefits were key motivators in the pharmaceutical industry’s decision to manufacture products there. This illustrates the point that pre-tax cost minimization should not be the key measure of supply chain success. Net income should be the key measure of supply chain success. Focusing on this cost demonstrates that point. (Should I contrast with wage rates?)

To understand the impact of operating in Puerto Rico upon these costs, it is necessary to understand distribution cost drivers in more detail.

**Distribution and Logistics Cost Drivers**

Firms looking to minimize income taxes may be attracted to tax havens. But reducing taxes may necessitate moving business activities, directly impacting supply chain costs. Moving factories away from its customer base increases distribution costs.

An in-depth examination the entire supply chain is beyond this paper’s scope. Supply chain analysis often involves elaborate analytical modeling, and both business schools and MNEs sometimes dedicate entire departments to this activity. Restructuring the supply chain has a direct impact upon these costs, so it is necessary to understand distribution’s primary cost drivers. The cost of shipping finished products to customers will be analyzed to accomplish this.

Key distribution and logistics cost drivers can be determined by reviewing the published rate guides for the largest distribution and logistics firms, such as UPS, Federal Express, and DHL. These firms specialize in distributing products efficiently and profitably. Not all businesses distribute products through third-parties, but outsourcing logistics is increasingly popular. A recent supply chain text explained:
“Several forces drive the development of third-party logistics. In a global environment, logistics and supply chain activities become more complex, expensive, and capital intensive. By outsourcing logistics activities, many companies can reduce their logistics costs and/or improve their customer service performance. This parallels the trend of outsourcing in manufacturing.”

For example, Sun Microsystems and Lego have recently outsourced distribution and logistics to DHL. While the cost structures of firms distributing their own products may not be available, the pricing structures of third-party firms can illustrate that activity’s key cost drivers.

Three key factors directly impact distribution and logistics costs. These are product weight, delivery time, and shipping distance. UPS, Federal Express and DHL each determine prices based on these factors. Other considerations may also be used to increase prices. For example, products requiring special handling, such as refrigeration, cost more to transport. Oversized packages that consume more space also incur surcharges. But base shipping charges are based on weight, speed and distance.

To illustrate this, the cost of shipping a product from Puerto Rico to the United States was calculated. Puerto Rico was selected as a popular tax haven located near the United States. The UPS web site was used to calculate the cost of shipping products from San Juan, Puerto Rico to various U.S. destinations. Shipping charges to Los Angeles, New York City, and Chicago were selected, as three populous cities in different regions. Rates for shipments from San Juan to New York City are displayed below:

<table>
<thead>
<tr>
<th>Shipping Costs: San Juan, Puerto Rico to New York City</th>
<th>5-Day Delivery</th>
<th>2nd Day Air</th>
<th>Next Day Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 pound package</td>
<td>13.80</td>
<td>27.67</td>
<td>40.73</td>
</tr>
<tr>
<td>10 pound package</td>
<td>33.21</td>
<td>57.83</td>
<td>84.59</td>
</tr>
<tr>
<td>100 pound package</td>
<td>161.07</td>
<td>248.85</td>
<td>355.25</td>
</tr>
</tbody>
</table>

Table 12: UPS Shipping Costs from Puerto Rico to New York City
Charges for shipments to Chicago averaged 9% below these figures, while charges for shipments to Los Angeles were, on average, 4% higher.\textsuperscript{132}

These figures were compared to shipping costs from another tax haven, Ireland, to the same U.S. destinations. Shipping costs from Dublin were significantly more expensive, and the same service level is frequently not possible. Next day delivery from Dublin to these cities is problematic. 2\textsuperscript{nd} Day and 5-Day services cost 3-8 times as much as shipments from San Juan, Puerto Rico.\textsuperscript{133}

These figures support several conclusions. First, product weight has a significant cost impact. Heavy products cost more to ship. For example, the cost of shipping a one hundred pound package is 9-12 times more than a one pound package, and 4-5 times more than a ten pound package. Second, delivery time has a major cost impact. For example, next day delivery costs 2-3 times more than 5-day delivery. Finally, distance increases cost. In addition to posing time zone, customer support and next day delivery service obstacles, shipping costs from Dublin to the United States far exceed those from San Juan, Puerto Rico.

Based on these costs, the profit impact for a hypothetical product can be calculated.

Suppose a product has a transfer price of $500, cost of goods sold is $300, and selling, general and administrative expenses are $50. The profit impact follows:

<table>
<thead>
<tr>
<th>Profit Impact</th>
<th>5 day, 1 lb.</th>
<th>5 day, 10 lb.</th>
<th>5 day, 100 lb.</th>
<th>2\textsuperscript{nd} day, 1 lb.</th>
<th>2\textsuperscript{nd} day, 10 lb.</th>
<th>2\textsuperscript{nd} day, 100 lb.</th>
<th>Next day, 1 lb.</th>
<th>Next day, 10 lb.</th>
<th>Next day, 100 lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer Price</td>
<td>500.00</td>
<td>500.00</td>
<td>500.00</td>
<td>500.00</td>
<td>500.00</td>
<td>500.00</td>
<td>500.00</td>
<td>500.00</td>
<td>500.00</td>
</tr>
<tr>
<td>COGS</td>
<td>300.00</td>
<td>300.00</td>
<td>300.00</td>
<td>300.00</td>
<td>300.00</td>
<td>300.00</td>
<td>300.00</td>
<td>300.00</td>
<td>300.00</td>
</tr>
<tr>
<td>Shipping</td>
<td>13.80</td>
<td>33.21</td>
<td>161.07</td>
<td>27.67</td>
<td>57.83</td>
<td>248.85</td>
<td>40.73</td>
<td>84.59</td>
<td>355.25</td>
</tr>
<tr>
<td>SG&amp;A</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>136.20</td>
<td>116.79</td>
<td>-11.07</td>
<td>122.23</td>
<td>92.17</td>
<td>-98.85</td>
<td>109.27</td>
<td>65.41</td>
<td>-205.25</td>
</tr>
<tr>
<td>Taxes (7%)</td>
<td>9.53</td>
<td>8.18</td>
<td>-.77</td>
<td>8.56</td>
<td>6.45</td>
<td>-6.92</td>
<td>7.65</td>
<td>4.58</td>
<td>-14.37</td>
</tr>
<tr>
<td>Net Profit</td>
<td>126.67</td>
<td>108.61</td>
<td>-10.30</td>
<td>113.67</td>
<td>85.72</td>
<td>-91.93</td>
<td>101.62</td>
<td>60.83</td>
<td>-190.88</td>
</tr>
</tbody>
</table>

Table 13: Impact of Shipping Expenses upon Net Profit

45
Based on this, several conclusions can be reached concerning products that will incur low incremental shipping and distribution costs if production is moved to a tax haven. First, light products incur low shipping charges. Second, products without urgent delivery requirements cost less to transport. Third, the shorter the distance the product has to be shipped, the lower the shipping and distribution costs. So nearby tax havens may be preferred. Fourth, products without special handling requirements, such as cold storage or oversized packages, will cost less to ship. And as mentioned previously, highly profitable products are also well-suited for tax havens due to the tax benefits.

**Intellectual Property and The Pharmaceuticals Industry**

The prior paper in this dissertation specifically addressed transfer pricing of intellectual property. In recent years, many firms have formed Cost Sharing Agreements (CSAs) to transfer intellectual property from the jurisdiction in which the intellectual property was developed to low-tax jurisdictions. To compensate the intellectual property developer, the tax haven subsidiary either makes a buy-in payment in return, or shares profit with the parent. Tax authorities in a number of countries, including the United States, have publicly expressed concern that compensation is inadequate. Special concern has been expressed about payments in high-technology industries, such as software, computer products, and pharmaceuticals. Within the United States, the Internal Revenue Service (IRS) has drafted proposed cost sharing regulations designed to increase the compensation due the intellectual property developer.

Concerning pharmaceutical products, Professor Scherer argues the ease with which pharmaceuticals can be transferred abroad also facilitates to the transfer of pharmaceutical manufacturing to tax havens. Scherer also believes patent protection for pharmaceutical products is not as strong as it is for many other products. He writes:

“Historically, drugs (along with other chemicals and foods) have been singled out for weaker patent protection under the laws of many nations than mechanical and electrical inventions. Switzerland, for example, had
long granted patents on drug manufacturing processes, but did not award patents on product formulas until 1977. This is a significant difference, since product patents normally provide much stronger barriers to generic imitation than process patents. Italy granted neither product nor process patents for drugs until it harmonized its patent process with those of other European community nations until 1978. As late as 1989, pharmaceutical products were not patentable in nearly half of the 101 national signatories to the Paris Convention for the Protection of Intellectual Property. In addition, numerous national laws authorize compulsory licensing when patented invention are not ‘worked’ (that is, produced) within the patent-granting nation. And many nations, especially less-developed countries, leave patents in force for much shorter durations that the 17 to 20 year periods customary in the United States, Europe and Japan.”

Transfer pricing issues associated with transfers of valuable intellectual property, such as pharmaceutical patents, can be difficult to resolve, as the value of comparable assets can be very difficult to quantify. One popular approach to resolving these issues is splitting profit between parent and subsidiary. “Courts confronted by intercompany pricing issues occasionally resort to an allocation of profits under some type of ‘profit split’ where related corporations…are treated as an economic unit,” according to one international tax text. “It is often the case that courts have used a 50/50 or similar somewhat arbitrary profit split to allocate net gain between a parent and subsidiary corporation.”

In *Eli Lilly & Co. v Commissioner*, (1988) an appeals court reviewed transfer pricing valuation connected to the Eli Lilly parent company’s transfer of manufacturing intangibles to its Puerto Rican subsidiary. The U.S.-based parent transferred manufacturing technology concerning the production of Darvon to its subsidiary, which manufactured and resold the products. The IRS argued the transfer pricing methodology apportioned to much profit to the Puerto Rican subsidiary. To resolve the issue, the court determined the parent and subsidiary should split profit. “After allocating to the U.S. parent a profit on its manufacturing costs and location savings, the court allocated the undivided profits to the U.S. parent’s marketing intangibles and the subsidiary’s manufacturing intangibles in a ratio of 45 percent to 55 percent. The court did not explain how it arrived at the 45/55 split.” However the general principle is that the more value contributed by the parent, the larger its share of the profits should be.
According to one text the profit split method is attractive, since it treats the related corporations “as one economic unit”\textsuperscript{139} and thus ensures profits or losses are shared.

As discussed in my prior paper, low compensation for intellectual property is widely believed to contribute to exports of intellectual property to tax havens. However it should be noted the compensation paid does reduce tax benefits. Suppose a pharmaceuticals firm transfers intellectual property from the United States to Puerto Rico, so its products can be manufactured there. Furthermore, suppose the company uses the 45/55 profit split allocation specified in the \textit{Lilly} case. As a portion of the profit must be repatriated to the United States, the pharmaceuticals firm’s worldwide tax rate is well above the low-tax rate in Puerto Rico.

<table>
<thead>
<tr>
<th>Profit Split Methodology</th>
<th>Puerto Rico earnings</th>
<th>United States earnings</th>
<th>Worldwide Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings before profit split</td>
<td>$100M</td>
<td>$0</td>
<td>$100M</td>
</tr>
<tr>
<td>Profit split</td>
<td>($45M)</td>
<td>$45M</td>
<td>-0-</td>
</tr>
<tr>
<td>Earnings after profit split</td>
<td>$55M</td>
<td>$45M</td>
<td>$100M</td>
</tr>
<tr>
<td>Tax rate</td>
<td>2%</td>
<td>35%</td>
<td>--</td>
</tr>
<tr>
<td>Taxes</td>
<td>$1.1M</td>
<td>$15.75M</td>
<td>$16.85M</td>
</tr>
<tr>
<td>Worldwide tax rate</td>
<td>--</td>
<td>--</td>
<td>16.85%</td>
</tr>
</tbody>
</table>

Table 14: Impact of Profit Split upon Worldwide Tax Rate

While Puerto Rico’s tax rate is 2% in the above example, the firm’s worldwide tax rate is nearly 17%, as the subsidiary shares profits with the parent. The more valuable the intellectual property contributed from a high-tax jurisdiction, the more profits should be shared with the parent, and the higher the worldwide tax rate.

\textbf{Pharmaceuticals and Logistics}

Pharmaceutical products possess many of the key characteristics suggesting low shipping and logistics expenses. In several ways its products are ideally suited to keep distribution costs low.
Pharmaceuticals products are extremely light. In contrast to the great majority of retail products, the products are not weighed. Dosages for common pharmaceutical products are measured by quantity and dosage strength. Most pills are so light the product weight is not meaningful information. Contrast this with products supplied by the selected DJIA firms. Pharmaceuticals weigh significantly less than food, beverages, and household staples supplied by firms such as Altria, Coca-Cola, Home Depot, Proctor and Gamble and Wal-Mart. They weigh far less than computer and communications products made by AT&T, Hewlett-Packard, IBM, and Verizon, or firms extracting natural resources, such as Alcoa and Exxon Mobil. They also weigh significantly less than products made by industrial firms such General Electric, General Motors, United Technologies, Honeywell, Boeing and Caterpillar. It is difficult to identify manufactured products weighing significantly less than pharmaceuticals.

The pharmaceuticals industry’s low logistics costs have been noted by supply chain experts. In Supply Chain Risk Management Donald Waters notes: “very few organizations can put a precise figure on their logistics expenditure, and many have almost no idea of the costs. A rule of thumb suggests a figure of around 15-20 percent of turnover, but this clearly varies across industries. Building materials, such as sand and gravel, have very high logistics costs compared with, say, jewelry, pharmaceuticals and cosmetics.” In other words, pharmaceutical distribution costs are below average, as Scherer noted.

Of the firms listed above, perhaps only Microsoft’s software products, when distributed over the Internet, carry lower logistics costs. It is worthwhile noting that Microsoft’s gross and pre-tax profit margins are quite high, and it has also developed an effective tax haven strategy, selling products from Ireland to other European countries.

In addition, pharmaceutical products are quite small, and can be stored in standard packaging. As mentioned, logistics firms add surcharges for oversized packages that consume more space. Most pharmaceutical products are extremely small and incur no such surcharges.
Finally, most pharmaceutical products do not spoil quickly. A restaurant such as McDonald’s must cool or freeze products to preserve them, which increases shipping costs. The great majority of pharmaceutical products can be stored safely at room temperatures for long periods. The shelf life of pharmaceuticals is measured in months or years, and one analysis indicates the average pharmaceutical shelf life is three years.¹⁴¹ Most pharmaceutical products do not need to be transported quickly, and can take advantage of lower shipping rates.

While the pharmaceuticals industry’s distribution costs are low, moving production from the United States to Puerto Rico will increase distribution costs. As will be shown in the next section, the largest market for Puerto Rican pharmaceuticals is the United States. In most cases it costs less to ship products within the United States than from Puerto Rico, and offers operational benefits as well (language, time zone, speed, etc.). The pharmaceuticals industry is attracted to Puerto Rico’s low tax rates. Because the pharmaceutical industry has low logistics costs, they are less likely to outweigh the tax benefits.

To summarize, most pharmaceutical products are light, small, do not have urgent shipping requirements, and do not have special handling requirements. As a result, the incremental distribution costs are likely to be low if the products are transferred to a tax haven. As demonstrated previously, the profit margins are also well above average, so pharmaceutical products may be excellent candidates for tax haven manufacturing.

**Puerto Rico’s Pharmaceuticals Industry**

Puerto Rico is one of the most popular tax havens located near the United States. As a U.S. Commonwealth, it enacts its own income tax rates. Puerto Rico actively seeks American and other firms, promoting its low income tax rate. At the same time, its proximity to the U.S. and legal status makes it relatively easy to export products into the U.S. quickly and easily. Puerto Rico advertises both its low tax rate and logistics infrastructure.
“Manufacturers can take advantage of Puerto Rico’s existing infrastructure, which includes state-of-the-art digital, fiber optic and satellite communications, one of the busiest container ports in the Western hemisphere, 40 shipping lines, regional and international airports that handle more than 4,000 cargo flights per month, a modern network of superhighways that ensure no location is more than two hours from an airport or seaport, and 5,359 megawatts of diversified electrical generating capacity. They can also count on Puerto Rico’s seasoned suppliers and service providers, including many contract manufacturing and packaging companies.”

The pharmaceuticals industry appears well-suited to take advantage of manufacturing opportunities in Puerto Rico, as Scherer noted. Does it do so?

The evidence indicates the pharmaceutical industry has made substantial investments in Puerto Rico. It is one of the leading industries there, supporting Scherer’s position that the pharmaceuticals industry’s relatively low manufacturing and distribution costs position it to take advantage of low income tax rates.

Puerto Rico is the #1 exporter of pharmaceuticals products in the world. According to one study, Puerto Rico accounts for 24.5% of the world’s pharmaceuticals exports. This is particularly significant since none of the world’s leading pharmaceutical firms originated in Puerto Rico. The industry’s most successful firms began in other countries, such as the United States, Germany, Switzerland and the United Kingdom. These firms later transferred manufacturing operations there, attracted by the combination of low tax rates and easy access to major markets. As one industry expert commented:

“When the first pharmaceutical plant on Puerto Rico began operation in 1957, perhaps few could have foreseen that a few short decades later the island would emerge as one of the world’s top manufacturing locations for pharmaceutical and biopharmaceutical products.

“But that is exactly what happened. Puerto Rico has benefited from a combination of tax incentives, proximity to the U.S. market and the energy, intelligence and determination of its people, attracting increasing foreign investment in the pharmaceutical, biotechnology and medical device industries...
“Puerto Rico’s geographic position provides a tremendous competitive advantage.”

The pharmaceutical industry dominates manufacturing there. Nearly 2/3 of Puerto Rico’s manufactured products are pharmaceuticals, as the following economic census data shows:

<table>
<thead>
<tr>
<th>Puerto Rico Shipments</th>
<th>Manufacturing Shipments 2002 (000 omitted)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmaceuticals</td>
<td>$38,446,602</td>
<td>65.6%</td>
</tr>
<tr>
<td>Food</td>
<td>4,883,924</td>
<td>8.3%</td>
</tr>
<tr>
<td>Computers and Electronic Products</td>
<td>2,288,076</td>
<td>3.9%</td>
</tr>
<tr>
<td>Beverages and Tobacco</td>
<td>1,547,995</td>
<td>2.6%</td>
</tr>
<tr>
<td>Petroleum and Coal</td>
<td>1,525,356</td>
<td>2.6%</td>
</tr>
<tr>
<td>Chemicals, not including pharmaceuticals</td>
<td>1,362,127</td>
<td>2.3%</td>
</tr>
<tr>
<td>Electronic Equipment and Appliances</td>
<td>1,100,588</td>
<td>1.9%</td>
</tr>
<tr>
<td>All Other Categories</td>
<td>7,425,392</td>
<td>12.7%</td>
</tr>
<tr>
<td>Total</td>
<td>$58,580,060</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 15: Puerto Rico Shipments

Note that pharmaceutical shipments are nearly eight times the volume of the nearest industry. Most of the other manufactured products above, such as food, computers, beverages, petroleum, coal, and electronic equipment are all significantly larger and heavier than pharmaceuticals, and thus incur substantially higher shipping charges.

Puerto Rico’s pharmaceuticals are primarily destined for the United States and other nearby markets. The following shows the destination of the combined $38.4B in pharmaceuticals and $1.4B in chemical products manufactured there. Information on the pharmaceuticals industry alone was not available, but chemical products account for only 4% of the total.
<table>
<thead>
<tr>
<th>Pharmaceutical and Chemical products Destination</th>
<th>Manufacturing Shipments 2002 (000 omitted)</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puerto Rico</td>
<td>$3,208,805</td>
<td>8.1%</td>
</tr>
<tr>
<td>United States</td>
<td>$28,206,620</td>
<td>70.9%</td>
</tr>
<tr>
<td>Virgin Islands</td>
<td>$929,249</td>
<td>2.3%</td>
</tr>
<tr>
<td>Caribbean, Central and South America</td>
<td>$791,305</td>
<td>2.0%</td>
</tr>
<tr>
<td>Other</td>
<td>$6,624,952</td>
<td>16.7%</td>
</tr>
<tr>
<td>Total</td>
<td>$39,760,931</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 16: Puerto Rico Shipments Destination

Moreover, the pharmaceuticals industry has invested broadly in Puerto Rico manufacturing. “Today, 19 pharmaceutical manufacturers account for more than 30,000 jobs at about 40 facilities…”147 one article noted. According to the Puerto Rico Investment Development Company (PRIDCO), an agency of the Commonwealth of Puerto Rico, 16 of the 20 best selling pharmaceuticals sold in the United States are manufactured there.148 It should be noted that many U.S.-headquartered firms, including Johnson and Johnson, Pfizer, Merck & Co., Abbott Laboratories, Wyeth, Eli Lilly and Co., Amgen, Bristol-Myers Squibb, and Schering Plough, Baxter International, Genentech, Genzyme and Gilead Sciences,149 have established manufacturing operations in Puerto Rico, for products are shipped back to the United States.

Wage rates are often cited as one reason firms move manufacturing overseas. This is an important supply chain cost, and is a factor firms consider when determining where to locate manufacturing activities. The pharmaceutical industry’s profit margins are well above average, so labor costs as a percent of revenue are likely to be lower than for other industries. According the most recent statistics, Puerto Rico’s manufacturing wage rates are lower than other U.S. states. The average wage rate for a non-supervisory manufacturing production in Puerto Rico was $488 per week, approximately 10-13% below other low wage states, such as Arkansas, Mississippi, and Rhode Island.150 However it should also be noted there are a number of five counties within the United States where the average wage rate is below that paid in San Juan, Puerto Rico.151
The history of the pharmaceuticals industry in Puerto Rico was reviewed with Kevin C. Richards, Vice President of Reed Expo and head of Reed Life Sciences, the largest organizer of trade events for the pharmaceuticals industry. At these events industry and government representatives come together to discuss the latest developments in the pharmaceuticals business. He is frequently a speaker at those events, and gave a keynote address at an event in 2006, entitled “Puerto Rico’s Pharmaceutical Industry: 40 Years Young!” Reed says: “The main reason Puerto Rico took off 40 years ago was the low tax rates, and low shipping costs. It’s a great hub.”

Reed believes that cheap, easy access to the United States also propelled the growth of the pharmaceuticals industry in Puerto Rico. He notes that Puerto Rico has a excellent road systems, a strong port system, and easy air access to the United States, the primary destination for its manufactured pharmaceutical products. He says: “It’s cheap and easy to get pharmaceutical products to the United States, which is over 70% of its market.” Richards agrees the pharmaceuticals industry balances supply chain costs against tax savings, and that the industry’s low distribution costs create the opportunity to take advantage of low tax rates. “You can probably ship one million pieces of Viagra for what it would cost you to ship fifty cars,” he says.

Ireland’s Pharmaceuticals Industry

The pharmaceutical industry is now Puerto Rico’s largest exporter. It grew through foreign direct investment in manufacturing facilities. As mentioned, Professor Scherer believes the primary causes were low tax rates, the pharmaceutical industry’s relatively low manufacturing and distribution costs, and the ease with which intellectual property can be transferred. If these factors led to the growth of Puerto Rico’s pharmaceutical industry, have they contributed to its growth elsewhere?

The evidence demonstrates these same factors have driven the Irish pharmaceutical industry’s growth. It is now one of that country’s leading exporters. According to one article “Ireland’s pharmaceutical industry is one of the largest in Europe despite the
country’s small size. It is dominated by foreign-owned, export-oriented multinational firms (most of the world’s largest pharmaceutical companies operate production facilities in Ireland).” According to one Irish government publication, “The pharmaceutical industry has been one of the principal contributors to the growth of the Irish economy in recent years.” Another article commented “Ireland Global pharmaceutical market growth is accelerating, with the vast majority of the market dominated by the developed countries of Europe, Japan, and the United States.”

Ireland’s pharmaceutical industry has grown very rapidly. In 1973, Ireland’s pharmaceutical industry exported less than €100 million. By 2007 pharmaceutical exports increased to €14.5 billion, or nearly 16% per year. It has been growing at and 18.4% annual growth rate since 1999. The following chart demonstrates the size and growth of that industry:

<table>
<thead>
<tr>
<th>Product Category</th>
<th>1999 Exports (€ Billion)</th>
<th>% of Exports</th>
<th>2007 Exports (€ Billion)</th>
<th>% of Exports</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic Chemicals</td>
<td>8,917.4</td>
<td>17.1%</td>
<td>19,427.0</td>
<td>21.9%</td>
<td>10.2%</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>3,778.2</td>
<td>7.3%</td>
<td>14,597.6</td>
<td>18.4%</td>
<td>18.4%</td>
</tr>
<tr>
<td>PharmaChem (includes both Organic Chemicals and Pharmaceuticals)</td>
<td>12,695.6</td>
<td>24.4%</td>
<td>34,024.6</td>
<td>38.4%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Office Products</td>
<td>11,874.5</td>
<td>22.8%</td>
<td>12,533.0</td>
<td>14.1%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Miscellaneous Manufactured Products</td>
<td>5,725.0</td>
<td>11.0%</td>
<td>8,425.7</td>
<td>9.5%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Food and Beverages</td>
<td>4,892.6</td>
<td>9.4%</td>
<td>8,792.2</td>
<td>9.9%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Fertilizers and Other Chemicals</td>
<td>3,882.9</td>
<td>7.5%</td>
<td>8,639.4</td>
<td>9.8%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Electrical Machinery</td>
<td>4,059.9</td>
<td>7.8%</td>
<td>4,857.0</td>
<td>5.5%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Other Machinery</td>
<td>4,500.6</td>
<td>8.6%</td>
<td>4,362.5</td>
<td>4.9%</td>
<td>-0.4%</td>
</tr>
<tr>
<td>Other Exports</td>
<td>4,431.1</td>
<td>8.5%</td>
<td>6,946.9</td>
<td>7.8%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Total</td>
<td>52,062.2</td>
<td>100.0%</td>
<td>88,581.3</td>
<td>100.0%</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

Table 17: Ireland’s Manufacturing Exports

Ireland’s government publications frequently state the pharmaceutical industry accounts for approximately 40% of Ireland’s exports. To arrive at this figure government and academic publications frequently combine the organic Chemicals and pharmaceuticals categories, which they call “the broader pharmachem measure.” Ireland’s organic
chemicals industry grew to provide active ingredients used in pharmaceutical products. As one publication noted “The pharmaceutical industry is relatively new to the Irish economy. Most of the companies operating in this area have had a presence in Ireland since the 1960’s. Originally the industry was largely involved producing active ingredients in bulk for exports to other countries to be processed into finished products (tablets, capsules, etc.). Subsequently, plants were set up to produce the finished products here.” Using either measure, the pharmaceuticals industry is one of Ireland’s largest exporters. The Irish government says it employs 24,000 people directly, and an additional 24,000 people are employed providing services to it.

Like Puerto Rico, a large number of pharmaceuticals firms have decided to locate there. Over 120 pharmaceuticals firms have invested in Ireland. 16 out of 20 of the largest pharmaceutical manufacturers have production operations there. 6 out of the world’s top selling pharmaceuticals are produced in Ireland.

The same factors have driven the growth of both Puerto Rico’s and Ireland’s pharmaceutical industry. Pharmaceutical firms have been attracted by low income tax rates and low cost, easy access to major markets. As one recent article on the pharmaceuticals industry noted “Manufacturing in Ireland exploits tax regime and proximity to major EU markets.” Another said: “During the late 1960s to early 1970s both Eire and Puerto Rico have provided bases for chemical and finished pharmaceutical manufacture for the EEC and USA, respectively. Both areas have advantageous investment and training grants, tax benefits designed to encourage industrial development and free access to major markets.”

Ireland consciously embarked on a low tax strategy to stimulate economic growth. As mentioned previously, Ireland’s corporate tax rate is 12.5%, well below the tax rates in England, France, Germany, Italy and other nearby European countries. According to Ireland’s Minister for Finance, reducing tax rates has stimulated Ireland’s economic growth:
“(W)e are committed to low taxation on enterprise and work. We tried the high tax model. Its results were the 1980’s with high unemployment, rampant emigration and budgetary chaos. Our present system of income taxation works far better…”

“As you are aware, we also cut corporation taxes. What were the consequences? We incentivized investment, encouraged risk-taking and attracted some of the best industries in the world with far-reaching consequences for employment, for trade and, not least, for the Exchequer.”\(^{171}\)

In addition to reducing income taxes, the Irish government reduced trade barriers that increased distribution costs. Tariffs can be a major impediment to international trade, and trade agreements to reduce these barriers can substantially reduce distribution costs, and facilitate international trade. Towards that goal, in 1965 Ireland signed the Anglo-Irish Free Trade Agreement, and in 1973 it joined the European Economic Community.\(^{172}\) Both of these agreements reduced tariffs, a significant barrier to trade.

EU trade costs dropped further in the 1990’s. One article noted: “Trade costs within the EU fell dramatically following the introduction of the Single Market Program, which effectively abolished non-tariff barriers (NTBs) within the EU with effect from 1993.”\(^{173}\) These non-tariff barriers include differing manufacturing and technical standards, health regulations, packaging rules, and other regulations that frequently differed in minor ways between European nations, but proved to be major trade barriers.\(^{174}\) Under the Single Market Program, countries mutually recognize each other’s standards, so firms do not have to comply with different regulations in each nation.\(^{175}\) The pharmaceutical industry, in particular, saw a substantial reduction in costs. The authors of one article commented: “We focus on the pharmaceutical industry because it is a major industry in Europe and one in which non-tariff barriers have been very significant in the past.”\(^{176}\)

“Since the implementation of the Single Market Program, MNEs can be more footloose than before in determining where to locate additional production in response to more/less favorable local business climates,”\(^{177}\) the authors write. This makes it substantially easier to shift manufacturing operations to locations with low tax rates. “At these low trade
costs manufacturing firms can locate anywhere and serve other regions without incurring any additional costs.”

Similar to Puerto Rico, a number of continental European-headquartered firms have moved manufacturing operations to Ireland, away from their customer base, thus increasing their distribution and logistics costs. GlaxoSmithKline (UK), Novartis (Switzerland), Sanofi-Aventis (UK), (what about Novo Nordisk and Alcon) all have substantial manufacturing operations in Ireland.

Like Puerto Rico, Ireland is making substantial investments in improving its distribution infrastructure, to make it easier to achieve supply chain and delivery requirements. “Continued upgrading of Ireland’s transport infrastructure is a central component of the plan. Major investment in Ireland’s transportation infrastructure got underway in the 1990’s, and had already borne fruit in the form of dramatic improvements in Ireland’s accessibility for travel purposes and in the logistics of Ireland’s international trade.”

Concerning wage rates, while Ireland’s wage rates were once below those of other nearby countries, today they are roughly comparable to those found in other countries. According to the U.S. Department of Labor Statistics, in 2007 Ireland’s wage rates for chemical and pharmaceutical products were approximately 13%-15% higher than the United States, France and France, and 6-8% below wages paid in Sweden and Germany. While wages may provide some incentive to manufacture products in Puerto Rico versus other U.S. locations, today they are not a major incentive to manufacture in Ireland.

Said Kevin Richards “Ireland is becoming the new Puerto Rico in pharmaceuticals. Right now it primarily supplies European countries. But you’re starting to see these countries competing with each other. The logistics costs are so low that you are seeing containers moving from Dublin to New York.”
Other Industries: Hewlett-Packard Printer Manufacturing Strategy

If it makes sense for the pharmaceutical industry to incorporate income tax considerations into supply chain decisions, these same considerations are likely to motivate other industries as well. There is evidence that other industries integrate income tax and supply chain issues to create a “tax efficient supply chain.” As mentioned previously, one article states that over 100 firms have linked supply chain and income tax decisions. One firm noted for high-margin products with low distribution costs is Hewlett-Packard’s inkjet printer business.

Bill Klein is Vice President of Business Development at BEA Systems and its former Chief Financial Officer. Prior to that, Klein was the CFO of Hewlett-Packard’s inkjet printer organization. In that role, Klein oversaw the finances of HP’s inkjet printer and inkjet cartridge product lines, together one of that company’s most successful businesses. In that and other roles Klein was very involved in determining where HP’s inkjet printer products were manufactured.

Klein says many factors need to be considered when manufacturing sites are selected. Some of these include cycle times, proximity to customers and suppliers, manufacturing costs, income taxes and supply chain costs. Klein says that while some of these costs are relatively easy to quantify, the impact of meeting customer delivery needs is more difficult to put into numbers. Customer delivery impacts a firm’s sales and market share. While it is more difficult to quantify this impact, it is one of the most important considerations.

Klein saw a clear financial advantage to manufacturing products with high profit margins and low logistics costs in tax havens, such as Puerto Rico, Ireland and Singapore. “You have to make sure the tax benefits are larger than potential increases in supply chain costs,” Klein says. “When the products have high profit margins, the tax benefits are large. But sometimes operating in a tax haven can lengthen your supply chain, and increase shipping costs and duties,” he says. “So ideal products for tax haven
manufacturing have high profit margins, but they are also light, small and easy to transport.”

For this reason HP determined inkjet cartridges were better products to manufacture in tax havens than inkjet printers. HP’s inkjet cartridges earn high profit margins, while the printers earn little or no margins, according to Klein. Low income tax rates made inkjet cartridge manufacturing attractive in tax havens. But in addition, inkjet cartridges are comparatively small, light and transportation costs are relatively low. “Manufacturing inkjet cartridges in Ireland, Singapore and Puerto Rico made a lot of sense,” he said. “Profit margins were high, so the tax savings were large. The additional distribution costs were minimal. It also made sense to have at least one manufacturing organization in Europe, Asia, and near the United States, to satisfy regional customer delivery demands.”

In contrast, the case for manufacturing printers in tax havens was less compelling. “The profit margins on the actual printers were extremely low,” said Klein, “so the tax benefits were not there, except for a few high end printers. And the shipping costs were a much larger percentage of the price, so keeping those costs down was much more important.”

**Defending the Income Tax Efficient Supply Chain**

As explained earlier in this paper, tax authorities are becoming concerned with the tax impact of supply chain restructurings. High income tax jurisdictions, such as the United States, the United Kingdom, France, the Netherlands, and Belgium, believe supply chain restructurings may reduce their tax revenue, so they are paying more attention to this activity. For example: “In the United Kingdom, the level of attention from the tax authorities has increased to match the greater flexibility with which MNEs approach their supply chain.” As tax practitioners frequently have to defend these restructurings to tax auditors, what actions can they take to support their position?
First, tax practitioners need to explain the business rationale for the supply chain restructuring, to satisfy the business purpose doctrine. They should be able to identify clearly how the restructuring improves the supply chain, customer satisfaction, or the pre-tax cost structure. Reduced trade barriers and improved communication technologies have created many opportunities to restructure and improve supply chains, and to eliminate overhead by centralizing many processes, so in most cases this should not be difficult to do. It certainly helps to analyze the operational impact and tax consequences simultaneously and restructure the supply chain once, so the business purpose doctrine can be satisfied. However centralizing a business process first to reduce the cost structure first, and later moving an activity to another locations for income tax purposes, increases audit risk. Tax authorities may argue the latter action was done solely to reduce taxes and does not satisfy the business purpose doctrine. This is one more reason why tax departments and supply chain organizations should collaborate when making these decisions.

Second, it is of course essential to comply with the arm’s length transfer pricing principle. “A primary requirement for tax purposes is to price the transactions arising from the supply chain model on an arm’s length basis,” said one article. This may seen obvious, but when an MNE restructures its supply chain, and changes responsibilities and risk within the enterprise, it may not be immediately obvious they need to reevaluate their transfer pricing policies. In fact, if the tax department is not involved and aware of the restructuring, they may incorrectly assume their prior transfer pricing policies are still valid. Said one article: “In the context of multinational enterprises, these changes lead to changes in the risk profile of the entities within the group and consequently in the profitability of operations in countries where activities take place. The changes may result in overall changes in the group’s profitability or a shift in the jurisdiction where profits arise—away from the place where activities are undertaken to the place where risks are assumed or functions are moved,” said one article. Restructuring the international supply chain more requires reviewing transfer pricing policies, another reason why supply chain and tax organizations need to collaborate.
Third, it is important is to ensure documentation is current, legal agreements between
business entities are still valid, and the impact on transfer pricing policies documented.
Tax practitioners in the United Kingdom wrote: “As ever, the answer is also to ensure
that the transfer pricing model adopted is solidly and competently implemented, namely
that legal contracts reflect functional reality; that intercompany transactions are properly
priced; that appropriate documentation and controls are in place; and that PE risks have
been addressed.”190 French tax practitioners had similar comments: “However, if (1) the
taxpayer has prepared adequate documentation in anticipation of a tax audit and if that
documentation supports the new methodology, (2) comparables have been gathered and
(3) the functions have been modified and the risks shifted out of France, the risk that the
tax authorities will be successful in their challenge is technically remote.”191

Tax authorities in Europe and the United States may use different approaches to
challenge restructurings. In Europe tax authorities frequently first question whether
permanent establishment laws have been breached. In the 2006 issue of International
Transfer Pricing Journal five articles written from a European perspective (United
Kingdom, Belgium, France, Spain and the Netherlands) said local tax authorities looked
closely at this issue.192 Referring to a meeting of the OECD’s Center for Tax Policy
Administration (CTPA), one article said: “One of the key questions of the CTPA
Roundtable pertained to the notion of a deemed PE created by activities of a limited
function for the foreign related parties for which a local entity is acting.”193 Therefore it
is extremely important for tax practitioners in Europe to be very aware of the permanent
establishment rules and developments in these countries.

Within the United States, tax authorities do not focus often on permanent establishment.
“In many countries, the permanent establishment (PE) rules are used to attack these
structures. Such is not the case in the United States, however, as the Internal Revenue
Service (IRS) typically uses the transfer pricing rules to evaluate whether the supply
chain restructuring is acceptable…In virtually all cases, the IRS moves immediately to
the transfer pricing question, without alleging the existence of a PE.”194 According to
that author, the IRS prefers to use other code sections or regulations to attack the tax
consequences of the restructuring. “Thus it is important, from a U.S. perspective, to obtain professional international tax assistance when planning a supply chain restructuring,” 195 the author writes.

Some believe tax authorities need to provide more guidance on these issues. “There is an urgent need for clear guidance…”196 wrote the Spanish authors, who are concerned with potential penalties they might face in the future. However business process changes frequently proceed more rapidly than tax law, so it is likely tax practitioners will need to be prepared to defend restructurings without the benefit of detailed guidelines from tax authorities.

**Conclusion**

MNEs around the world are restructuring their supply chains to improve them. These restructurings have tax consequences, whether or not tax reduction is a goal of the restructuring. In addition, tax authorities in many high income tax countries are well aware of these restructurings, believe they may reduce their tax revenue, and are paying close attention to them. For this reason alone, tax departments need to understand how their supply chain is being restructured.

While the great majority of supply chain papers dedicate little attention to taxes, firms should explicitly consider taxes when making supply chain decisions. For many firm’s it is one of a firm’s largest expenses, and ignoring its impact is a mistake. Financial analysts may argue whether net income or free cash flow is a better measure of shareholder value, but they agree both measures should be evaluated net of income taxes.

Encouraging supply organizations and tax departments to collaborate has many advantages. Through collaboration firms can make better supply chain decisions that aim to improve net income, a key driver of shareholder value. Beyond this tax departments need to be informed about supply chains are being restructured. Changes in responsibilities and risk assignments need to be documented, legal agreements between business entities may need to be rewritten, and transfer pricing policies may need to be changed, to reflect changes in responsibilities. Tax departments will need to prepare
documentation for tax authorities demonstrating the restructuring satisfies the business purpose doctrine. Ignoring these responsibilities increases the risk of an unsatisfactory tax audit and related repercussions.

This corporation’s functional and legal model has also been analyzed to determine where the best opportunities exist to link supply chain and tax planning and improve a firm’s net income. In most situations the sales company is not a good opportunity, due to high tax rates in developed countries, and the need to provide local sales and service support, which can trigger permanent establishment and local taxation. Distribution centers and international procurement offices have potential, but applicable tax laws should be examined, to determine if parent-country tax laws limit this opportunity. Manufacturing companies may present the best opportunity for many firms. Manufacturing products creates business substance international tax laws tend to support. Employees must be hired and trained, manufacturing know-how needs to be transferred, and assets must be purchased, installed and used. For this reason the manufacturing organization is the organization that assumes the most risk, and earns superior profits when the business is successful.

Professor F.M. Scherer has argued the pharmaceutical’s low manufacturing and distribution costs, along with the ease with which its intellectual property can be transferred, have combined to produce a successful Puerto Rican pharmaceutical manufacturing industry. The pharmaceutical industry’s gross and operating profit margins are well above those earned by most manufacturing firms. Its transportation and distribution costs are relatively low. As explained in my prior paper, the compensation currently being paid for intellectual property is widely perceived to be low, and intellectual property can be transferred easily. These factors have combined to stimulate foreign direct investment in the Puerto Rican pharmaceutical industry.

Similar factors have led to the growth of Ireland’s pharmaceutical industry. In 1969 it was a relatively small business there. Since then Ireland has reduced its tax rate, joined the EU which driven down tariffs, and the Single Market Program has reduced trade
barriers, which some argue were particularly burdensome to pharmaceutical firms. Today it pharmaceuticals is that nation’s second largest exporter, just behind organic chemicals, which provides active ingredients also used by pharmaceutical firms.

There is also some evidence that high profit margins and low logistics costs were key motivators in Hewlett-Packard’s decision to locate inkjet cartridge manufacturing facilities in Puerto Rico, Ireland and Singapore.

Analysis of the tax efficient supply chain is a relatively new, and there are many opportunities to expand upon the ideas presented in this paper.

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3 Ibid
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11 Ibid
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15 13 L.P.R.A. § 10101, Puerto Rico Tax Laws
17 Commissioner v. Newman, 47-1 USTC ¶ 91775, 35 AFTR 857, 159 F.2d 848 (CA-2, 1947)
18 Gregory v. Helvering, 69 F.2d 809, 810-811 (2d Cir. 1934)
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43 Ibid
44 IRS Regulation §1.482-3(b)(1)
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47 IRS Regulation §1.482-5(b)
48 IRS Regulation §1.482-1(c)(1)
50 IRC §482
51 IRC §6662(e), §6662(h)
53 IRC §6662
54 Ibid
55 Ibid

Ibid


Subpart F is found in IRC §951-§964


IRC §941


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13 L.P.R.A. § 10101, Puerto Rico Tax Laws


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131 Ibid, pages 287-288
132 All figures were calculated using the UPS web site in December, 2007. Note that dates can change on a daily basis due to changes in fuel rates and associated surcharges. See http://www.ups.com.
133 Ibid
136 Ibid
137 See Eli Lilly &Co. v Commissioner, 7th Circuit, 1988
139 Ibid, page 285
142 Richards, Kevin C., “Puerto Rico’s Pharmaceutical Industry: 40 Years Young!,” Pharmaceutical Online, September 20, 2006; http://www.pharmaceuticalonline.com
144 Richards, Kevin C., “Puerto Rico’s Pharmaceutical Industry: 40 Years Young!, Pharmaceutical Online, September 20, 2006; http://www.pharmaceuticalonline.com
146 Ibid, page 50
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161 “Economic Contribution of the Pharmaceutical Industry to Ireland,” http://www.ipha.ie
164 “Economic Contribution of the Pharmaceutical Industry to Ireland,” http://www.ipha.ie
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Sloppy Ireland. Novo Nordisk and Alcon.