Foreign Direct Investment or Outsourcing : A Tax Integrated Supply Chain Decision Model

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Abstract

Multinational companies should look at tax information at a strategic level rather than at a tactical level. Holistic inclusion of tax information lead companies to make more realistic decisions about where to make, source, locate, move and store products. Many developing economies, specifically, Asian countries, have included tax-holidays in their export-import (EXIM) policy for companies operating in Free Trade Zones (FTZs). Including this information in the supply chain planning could save millions of dollars for the companies operating globally. While designing global supply chains, integrating tax information with the sourcing alternatives, such as, Foreign Direct Investment (FDI) and outsourcing, can achieve powerful results. In this paper, we propose a tax integrated mixed integer model, for optimally deciding the FDI-outsourcing alternatives at the various stages of a global supply chain. We analyze this model by incorporating FTZs on an 8-stage example supply chain.

1 Introduction

Trade liberalization and information technology development accelerates firms to trade and invest across national borders. Firms could trade across national borders either by intra-firm-trade (FDI) or arms-length-trade (foreign outsourcing). FDI includes corporate activities such as building plants or subsidiaries in foreign countries, and buying controlling stakes or shares in foreign companies. It is now a competitive requirement that businesses invest all over the globe to access markets, technology, and talent. Firms located in industrialised countries pursue vertical disintegration of their production processes by outsourcing some stages in foreign countries where economic conditions are more advantageous. A firm that chooses to keep the production of an intermediate input within its boundaries can produce it at home (standard vertical integration) or in a foreign country (FDI). Alternatively, a firm may choose to outsource an input in the home country (domestic outsourcing) or in a foreign country (foreign outsourcing). Intel Corporation provides an example of the FDI strategy; it assembles most of its microchips in wholly-owned subsidiaries in China, Costa Rica, Malaysia, and the Philippines. On the other hand, Nike provides an example of foreign outsourcing strategy; it subcontracts most of its manufacturing to independent producers in Thailand, Indonesia, Cambodia, and Vietnam.

FDI and outsourcing have been studied extensively in the economics literature. Economists have developed theoretical models for investigating the decision of the firms to source abroad either through foreign outsourcing (FO) or foreign direct investment (FDI) (Antras and Helpman (2004)) and firm's decision to serve foreign markets through exporting or FDI (Helpman et. al. (2004)). Grossman and Helpman (2002,2005) have studied the trade-off between outsourcing and in-house production in a closed economy, and between outsourcing from the home country and from abroad, respectively. Grossman and Helpman (2003) study instead the trade-off between FDI and outsourcing in a foreign country. They assume that the producers of final goods, located in a Northern region, find it convenient to buy inputs from a Southern region, since wages in the South are lower than wages in the North. In addition, Grossman and Helpman (2003) suppose the local suppliers in South to be more efficient with respect to a production unit eventually setup in the Southern region by the final producers through a vertical FDI. However, the eventual relationship with the suppliers is plagued with contractual difficulties, linked to the uncertain legal framework of the South, and therefore for the final producers a trade-off arises between the greater efficiency gained through outsourcing, and the contract incompleteness they might avoid if they produce their required inputs through a FDI. The work by Almonte and Bonassi (2004) contributes with some refinements to the Grossman and Helpman (2003) model as far as the treatment of the FDI alternative is concerned and explores the extent to which the production strategies of the final producers are sensitive to the degree of contract incompleteness of a host country, and how in turn the latter affects the establishment of linkages between the final producers and the local suppliers. Gorg et. al. (2004), have done an econometric study on outsourcing using Irish manufacturing plant data. For more details on FDI and outsourcing studies we refer to Antras (2003), Domberger (1998), Feenstra (1998), Feenstra and Hanson (2001), Groot (2001), and Hummels et. al. (2001).

1.1 Contribution

Globalization, cost pressures and market demands for new and innovative products are key factors behind many complex supply chain challenges today. When planning a global supply chain, understanding and effectively managing tax liabilities can result in tens or hundreds of millions of dollars in savings (Irving et al. (2005)).

Standalone supply chain initiatives, such as network optimization, strategic sourcing, and lean manufacturing, reduce operating expenses and working capital requirements, as well as improve cash flow and asset utilization. They can also lead to the development of new intangible assets and improved profits. Yet because standalone supply chain initiatives focus only on pre-tax cost reduction, they overlook the fact that for each dollar of operating savings generated, only a limited portion of the benefit as little as sixty cents on the dollar, depending on the tax jurisdiction will fall to the bottom line after taxes.

Similarly, when tax planning is performed independently from supply chain planning, it tends to focus on historic levels of income and expense in the company, missing the focus on the future state, reduced operating costs and higher profitability model.

Either type of initiative, undertaken in isolation, prevents companies from achieving a greater after-tax return from their supply chain improvements. Conversely, when the two initiatives are integrated the combination can achieve powerful results. Companies can enjoy the expanded benefits of enhanced supply chain profitability and lower compliance risks without the burden of high tax rates or exposure to tax compliance risks.

In this research we propose a mixed integer model for deciding the optimal FDI-outsourcing alternatives at the various stages of a global acyclic supply chain by taking into account the export and import tax liabilities. This model is termed as the tax integrated model. The tax integrated model is obtained as an extension of the weighted version of the model proposed in Viswanadham and Balaji (2005). So, it is a quantitative model. That is, it would output what percentage to make or source using a particular FDI-outsourcing alternative. Integration of taxes and various other regulatory factors in global supply chain design had also been studied in Arntzen et al. (1995), Cohen et al. (1989), Goetschalckx et al. (2002), and Oh and Karimi (2004).

Even though, the tax integrated model is applicable with more general tax structure, we analyze the model by incorporating tax-holidays enjoyed by locating the various stages of a global supply chain in free trade zones (FTZs).

FTZs are special economic zones where export bound goods can be manufactured, assembled and inventoried with generous tax-holidays on custom duty and import/export taxes. These zones are introduced in many countries, specifically developing economies, as a part of its export and import (EXIM) policy to encourage exports and FDI on export sector. For the purposes of trade operations, duties and tariffs, the FTZs are considered as a foreign territory. So, any goods supplied to FTZ from Domestic Tariff Area (DTA) are treated as deemed exports and goods brought from FTZ to DTA are treated as imported goods.

In the recent past many developing economies in Asia have created FTZs to attract FDI for exports. In Bajpai and Dasgupta (2004) it is observed that China′s FDI for the export sector has grown rapidly by the creation of FTZs. It is quite interesting to study the strategic location of the various stages of a global supply chain in the presence of FTZs. In this research we address this strategic problem.

1.2 Organization

Deciding between FDI and outsourcing for various activities of a firm is a hard decision problem, especially when the number of alternatives to accomplish an activity is many. In Section 2, we state this problem. Theoretical models had been developed in the literature to study FDI versus outsourcing (Antras and Helpman (2004), Grossman and Helpman (2002,2003,2005), and Helpman et al. (2004)). Eventhough, these models provide insights in the decision making process, none of them can be applied in the quatitative context (what percentage to make/source using a particular alternative?). In Section 3 we propose a quantitative and weighted Mixed Integer Nonlinear Programming (MINLP) model. This model is a weighted version of the MINLP model for the single product case proposed in Viswandham and Balaji (2005). The weighted MINLP model allows the optimal decisions to be obtained by weighing the various objectives. The impact of taxes and tariffs is enormous in the design of a global supply chain. It is critical that the tax consequences and opportunities of introducing business change into the supply chain are included as an integral part of the change process. In Section 3 we propose a tax integrated model for optimally deciding the FDI-Outsourcing alternatives for the various stages of a global supply chain. Most supply chain managers already employ tools like FTZs to save on customs duties and export/import taxes. In Section 4 we analyze the tax integrated model by employing such tools.

2 Problem Statement

A global supply chain spans several countries and regions of the globe. We consider a multi-stage global supply chain network where each stage represents an activity such as, production, assembly, transport, distribution or retail. We assume that the supply chain has N stages, say, $S_1, S_2, \ldots, S_N$. At each stage, the activity could be accomplished using either of the different FDI/Outsourcing alternatives that are possible. For example, in the DEC global supply chain for personal computers (Arntzen et. al. (1995)), for the demand in UK, the memory manufacturing activity could be accomplished by either of these FDI/Outsourcing alternatives: (a) outsourcing to a partner in Singapore or Malaysia, or (b) setting up a plant of the company in China to exploit the skilled and low cost labour. Let there be K such different alternatives, $A_1, A_2, \ldots, A_K$, associated with each stage (the number K could be different for different alternatives). A 0-1 FDI-Outsourcing strategy, S, is obtained by choosing exactly one FDI/Outsourcing alternative (among the K alternatives) for each stage S_i, $1 \leq i \leq N$. The strategy S can be represented by a $N \times K$ matrix (s_{il}), where $s_{il} = 1$, if for the stage i, alternative l is chosen, $s_{il} = 0$, otherwise. This implies, $\sum_{l=1}^{K} s_{il} = 1$, for each stage i. Let the cost matrix (c_{il}) be an $N \times K$ matrix, where c_{il} is the cost associated to the alternative l for the stage i. For a 0-1 FDI-Outsourcing strategy S, the cost $c(S)$ associated with it is defined as, $\sum_{i=1}^{N} \sum_{l=1}^{K} c_{il} s_{il}$. An optimal 0-1 FDI-Outsourcing strategy would have the minimum cost. By definition, an optimal 0-1 FDI-Outsourcing strategy minimizes the overall supply chain cost. The problem of determining the optimal 0-1 FDI-Outsourcing strategy is termed as the 0-1 FDI-Outsourcing decision problem.

We consider the relaxed version of the 0-1 strategy, S, in which $0 \leq s_{il} \leq 1$ (possibly with some, s_{il} set to 0 or 1). In this context, the 0-1 FDI-Outsourcing strategy and the 0-1 FDI-Outsourcing decision problem are refered as FDI-Outsourcing strategy and FDI-Outsourcing decision problem, respectively.

3 Modeling

A supply chain could be acyclic or cyclic. The production and distribution networks are examples of acyclic supply chains. The distribution network along with the stage(s) in which the distributed products that are defective are subsequently recalled, repaired, and redistributed, is an example of a cyclic supply chain.

For acyclic supply chains, in this section, we propose MINLP models for the FDI-Outsourcing decision problem. First, we propose a model termed as the weighted base model. We propose an extension of this model by incorporating tax. This model is referred as the tax integrated model.

In both the models, every stage has production and inventory costs. In the case of FDI the capital costs are absorbed in the production cost. In the case of outsourcing the production cost is equivalent to the procurement cost. The transport cost between the various stages of the supply chain is also captured in the models. The inventory, production and transport costs are assumed to be per lot cost, if their respective lot sizes are specified. Otherwise, the cost corresponds to the per unit cost with lot size set to 1. When the mean demand and the standard deviation of the demand are specified for the final stages (sink nodes) in the supply chain, the mean demand and the standard deviation demand for the non-final stages (non-sink nodes) are computed as follows. Let G be a supply chain network. Let $A(G)$ denote the set of all directed edges (dependencies between the stages) in the supply chain. For a stage i in the supply chain, let μ_i and σ_i be the mean and standard deviation of demand. For a non-sink node i, $\mu_i = \sum_{j:(i,j)\in A(G)} \mu_j$, and, $\sigma_i = \sqrt{\sum_{j:(i,j)\in A(G)} \sigma_j^2}$, assuming for all js$'$ either both μ_j and σ_j are specified (in the case of sink nodes) or computed apriori. This can be achieved by computing μ_i and σ_i for the non-sink nodes in reverse topological order[1]. Assuming the demand distribution is normal, the demand of stage i is computed as, $D_i = \mu_i + k\sigma_i$, where k is the service-level.

With these terminologies we propose the weighted base model.

3.1 Weighted Base Model

For a supply chain network, G, N denotes the number of nodes (stages), and $A(G)$ denotes the set of all directed edges (dependencies between the stages) in the supply chain. The number of possible alternatives at each stage is denoted by K. We propose the following MINLP model termed Weighted Base Model. The objectives production cost (PC), transportation cost (TC), and inventory holding cost (IHC), that have to be minimized are weighted by assigning weights, w_{PC}, w_{TC}, and w_{IHC}, respectively. The weights w_i, where $i \in \{PC, TC, IHC\}$, should satisfy, (i) $0 \leq w_i \leq 1$, and (ii) $\sum_i w_i = 1$.

$$\text{MINLP (Weighted Base Model)} : \textsf{minimize } w_{PC}(\sum_{i=1}^{N}\sum_{l=1}^{K} PC_{il}\lceil \frac{D_i x_{il}}{PLS_{il}} \rceil)$$

$$+w_{TC}(\sum_{i=1}^{N}\sum_{l=1}^{K}\sum_{j:(i,j)\in A(G)}\sum_{m=1}^{K}\sum_{r=1}^{n_{mode}} TC_{iljmr}\lceil \frac{D_j x_{iljmr} x_{il} x_{jm}}{TLS_{iljmr}} \rceil)$$

$$+w_{IHC}(\sum_{i=1}^{N}\sum_{l=1}^{K} IHC_{il}\lceil \frac{D_i x_{il}}{IHLS_{il}} \rceil (ILT_{il} + PLT_{il} - OLT_{il}))$$

$$\textsf{subject to } \sum_{l=1}^{K} x_{il} = 1, \forall 1 \leq i \leq N,$$

$$\sum_{r=1}^{n_{mode}} x_{iljmr} = 1, \forall i, l, j, m, \text{ such that } (i,j) \in A(G),$$

$$OLT_{il} + TT_{iljmr} - ILT_{jm} \leq 0, \forall i, l, j, m, r,$$

$$\text{such that } (i,j) \in A(G),$$

$$0 \leq x_{il} \leq 1, x_{iljmr} = 0 \text{ or } 1, ILT_{jm} \geq 0.$$

In the above model, the decision variables x_{il}, correspond to the percentage of demand satisfied for a stage i through an alternative l. For any two

[1] A reverse topological ordering is an ordering of the nodes of an acyclic graph such that for any directed arc (u, v), v appears before u in the ordering.

stages i and j, such that $(i, j) \in A(G)$, and alternatives l and m, respectively, we define the following for the above model. The terms PC_{il}, TC_{iljmr}, IHC_{il}, denote the per lot production cost (PC), transportation cost (TC), and the inventory holding cost (IHC), respectively. The production lot size (PLS), transport lot size (TLS), and inventory holding lot size (IHLS), are denoted by PLS_{il}, TLS_{iljmr}, and $IHLS_{il}$, respectively. The number of transport modes available between any two nodes is assumed to be n_{mode}. In case, some transport mode is not available between a pair of nodes, a huge cost could be added with respect to that mode. Since, the weighted base model is a minimization problem this mode would never be included in the optimal solution. It is also assumed that exactly one mode is used to tranport goods from stage i to stage j, with alternatives l and m, respectively. This implies, that the decision variables, $x_{iljmr} = 1$, if the goods that has to be transported between stage i and stage j with alternatives l and m, respectively, is transported using the transport mode, r. Otherwise, the decision variables, $x_{iljmr} = 0$. The term, D_i, denotes the demand at stage i. Without loss of generality, D_i, is assumed to be per day demand. For a stage i and an alternative l, the production lead time (PLT), the inbound lead time (ILT) and the outbound lead time (OLT) are denoted by PLT_{il}, ILT_{il}, and OLT_{il}, respectively. The term TT_{iljmr} denotes the transport time (TT) from i to j with alternatives l and m, respectively, and r is the mode of transport. The terms PLT_{il}, OLT_{il}, ILT_{jm}, and TT_{iljmr}, are assumed to be in days (without loss of generality). The terms PLT_{il}, OLT_{il}, and TT_{iljmr}, are specified to solve the weighted base model. The term ILT_{jm} are decision variables in the weighted base model. The decision variables ILT_{jm} should be non-negative, for any non-source node j. For source nodes i, ILT_{il} can be set to 0. For a real number α, the term $\lceil \alpha \rceil$ denotes the smallest integer greater than or equal to α.

3.2 Tax integrated model

Integrating tax in the supply chain decisions may find the company to have a competitive advantage that would otherwise have been missed. For example, in resourcing or relocating part of the supply chain to a different part of the globe. Therefore, taking the tax information into account can lead to recommend changes in supply chain structure, in sourcing rules, in supplier base, and other factors. These changes would position the company better than its competitors in the market. So, it is better to include tax information at strategic level decision making rather than at a tactical level. In this we propose a strategic decision model by including tax. This model is termed the Tax Integrated Model and obtained by extending the Weighted Base Model.

$$\text{MINLP (Tax Integrated Model)} : \textsf{minimize } w_{PC}(\sum_{i=1}^{N}\sum_{l=1}^{K} PC_{il}\lceil \frac{D_i x_{il}}{PLS_{il}}\rceil)$$

$$+w_{TC}(\sum_{i=1}^{N}\sum_{l=1}^{K}\sum_{j:(i,j)\in A(G)}\sum_{m=1}^{K}\sum_{r=1}^{n_{mode}} TC_{iljmr}\lceil \frac{D_j x_{iljmr} x_{il} x_{jm}}{TLS_{iljmr}}\rceil)$$

$$+w_{TAX}(\sum_{i=1}^{N}\sum_{l=1}^{K}\sum_{j:(i,j)\in A(G)}\sum_{m=1}^{K}\sum_{r=1}^{n_{mode}} TAX_{iljm} D_j x_{iljmr} x_{il} x_{jm})$$

$$+w_{IHC}(\sum_{i=1}^{N}\sum_{l=1}^{K} IHC_{il}\lceil \frac{D_i x_{il}}{IHLS_{il}}\rceil(ILT_{il}+PLT_{il}-OLT_{il}))$$

$$\textsf{subject to } \sum_{l=1}^{K} x_{il} = 1, \forall 1 \le i \le N,$$

$$\sum_{r=1}^{n_{mode}} x_{iljmr} = 1, \forall i,l,j,m, \text{ such that } (i,j)\in A(G),$$

$$OLT_{il} + TT_{iljmr} - ILT_{jm} \le 0, \forall i,l,j,m,r,$$

$$\text{such that } (i,j)\in A(G),$$

$$0 \le x_{il} \le 1, x_{iljmr} = 0 \text{ or } 1, ILT_{jm} \ge 0.$$

In the above model TAX_{iljm} denotes the tax incurred per unit for transferring the good from stage i with alternative l to stage j with alternative m. The term w_{TAX} is the weight associated with respect to the tax objective. The remaining terms are as defined in the weighted base model. The weights w_i, $i \in \{PC, TC, TAX, IHC\}$, are assigned such that (i) $0 \le w_i \le 1$, and (ii) $\sum_i w_i = 1$.

4 Analysis of the tax integrated model

In this section, we analyze the tax integrated model proposed in Section 3.2, for a 8-stage supply chain shown in Figure 1. We group the various stages of the 8-stage supply chain as follows.

(a) Group 1 - Disk, Memory, Motherboard, and Processor manufacturing,
(b) Group 2 - Personal Computer Assembling,
(c) Group 3 - Software Procurement,
(d) Group 4 - System building.
We assume a two-country (North and South) model, as in Grossman and Helpman (2003). With this assumption, for each stage of the 8-stage supply chain, the different alternatives could be,

(i) outsourcing to a low cost country in the South,

(ii) outsourcing to a low cost country in the North (other than the home country),

(iii) outsourcing to low cost supplier(s) at home,

(iv) FDI in low cost country in the South,

(v) FDI in low cost country in the North (other than the home country),

(vi) manufacturing/assembling at home (in-house).

We refer to these as Alternative 1-6, respectively. With these alternatives, we studied the FDI-Outsourcing decision problem by including tax information for North and South bound demands. Taxes were included in the model with the following assumptions (a) and (b).
(a) The activities that are executed in South are assumed to be executed in FTZs. That is for the activities that are accomplished using the alternatives 1 or 4 we account for tax-holidays enjoyed by the company by manufacturing/assembling in FTZs. The tax-holidays are taken into account only for North bound demand. No tax-exemption was given to South bound demand as it would be considered an import.
(b) The activities that are executed in North are assumed to be executed in DTAs. That is no tax-exemption were accounted when the activities are carried out in North.

The parameters of the tax integrated model were set as detailed in the following sub-section 4.1.

4.1 Parameters setting

The tax integrated model is analyzed for various demand types, namely, High, Medium and Low. For the sink node, Distribution, in the case of High,

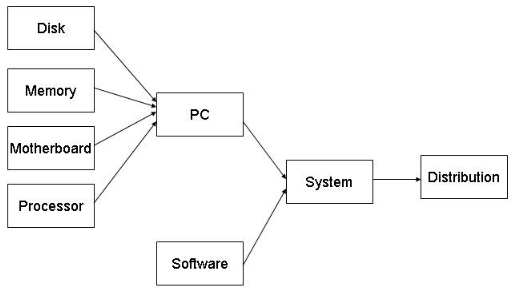

Figure 1: A 8-stage supply chain

Medium and Low demand types the mean demand (μ_{Dist}) and standard deviation of demand (σ_{Dist}), are set as follows,
(a) High - $\mu_{Dist} = 10000$ and $\sigma_{Dist} = 1000$,
(b) Medium - $\mu_{Dist} = 5000$ and $\sigma_{Dist} = 500$,
(c) Low - $\mu_{Dist} = 1000$ and $\sigma_{Dist} = 100$.
By setting the service level to 1, the demand for the various stages with High, Medium, and Low type, are computed as 11000, 5500, and 1100, as detailed in Section 3. Production lead time, PLT_{il}, and outbound lead time, OLT_{il}, were set to 1 and 0, respectively, for all i and l. The lot sizes $IHLS_{il}$, PLS_{il}, and TLS_{iljmr}, were set to 1000,100 and 1000, respectively. The inventory holding cost associated to the different alternatives with respect to the North and South bound demand, is set for the various stages of the supply chain as follows . The inventory holding cost, IHC_{il}, is set to 1000 for holding in North, and one-third of its cost, that is 333.33, for holding in South. The production cost, PC_{il}, for the various alternatives, is shown in Table 1. From any stage i to any other stage j, we assumed that there is a single mode of transport, that is $n_{mode} = 1$. For any two distinct stages, the transport cost, TC_{iljmr}, and the transport time, TT_{iljmr}, from North to South and vice versa, are set to be 1000 and 2, respectively. Transport cost and transport time within North or South are set to 333.33 (one-third of North-South) and 1 (half of North-South), respectively. The taxes TAX_{iljm} are set to 20% of $\lceil \frac{PC_{il}}{PLS_{il}} \rceil$, if $l = 2, 3, 5$ or 6 and set to 0, if $l = 1$ or 4. The objectives are set equal weights. That is, $w_i = \frac{1}{4}$, for all $i \in \{PC, TC, TAX, IHC\}$.

Alternative/Demand Type	High	Medium	Low
Alternative-1	50	100	150
Alternative-2	100	150	200
Alternative-3	150	200	250
Alternative-4	100	150	200
Alternative-5	150	200	250
Alternative-6	200	250	300

Table 1: Production cost

With these settings the results obtained by solving the tax integrated model are detailed in the following sub-section 4.2.

4.2 Results and Discussion

The tax integrated model was solved using the CONOPT solver[2] of GAMS Optimization Suite. The model was solved for the High, Medium and Low demand cases for North and South bound demand. The optimal FDI-Outsourcing strategies for North - High, Medium and Low demand and South - High, Medium and Low demand, are shown in Tables 2-4 and 5-7, respectively.

The results obtained suggest that for both North and South bound demand the optimal strategy is to produce in South. The strategy is quite intuitive as it saves on the production cost and the taxes. We also observe that in both North and South bound demand cases, the percentage of outsourcing decreases and the percentage of FDI increases as we move from the demand type High to Low. This implies that it is cost effective, (i) to outsource when the demand is high, and (ii) manufacture inhouse/FDI when the demand is low, as the capital cost would be low. Finally, we observe that the percentage of outsourcing increases and the percentage of FDI decreases as we move from the system building stage to the manufacturing stage of disk, motherboard, memory and processor (in all the cases). This suggests that as we move upstream from the customers the echelons which are closer to the customers should be substantially owned by the company, eventhough, they may opt to outsource stages that are farther away from the customers.

[2]CONOPT is a solver of ARKI Consulting and Development, Denmark, for solving large-scale nonlinear programs (NLPs). More details can be found in http://www.conopt.com

Alternative/Group	1	2	3	4
Alternative-1	81.45	69.31	74.68	41.02
Alternative-2	0.0	0.0	0.0	15.71
Alternative-3	0.0	0.0	0.0	2.25
Alternative-4	18.55	30.69	25.32	41.02
Alternative-5	0.0	0.0	0.0	0.0
Alternative-6	0.0	0.0	0.0	0.0

Table 2: 8-stage North-High strategy

Alternative/Group	1	2	3	4
Alternative-1	79.09	68.22	72.32	40.22
Alternative-2	0.0	0.0	0.0	16.60
Alternative-3	0.0	0.0	0.0	2.96
Alternative-4	20.91	31.78	27.68	40.22
Alternative-5	0.0	0.0	0.0	0.0
Alternative-6	0.0	0.0	0.0	0.0

Table 3: 8-stage North-Medium strategy

Alternative/Group	1	2	3	4
Alternative-1	68.32	62.51	62.51	34.32
Alternative-2	0.0	0.0	0.0	20.17
Alternative-3	0.0	0.0	0.0	6.05
Alternative-4	31.68	37.49	37.49	34.32
Alternative-5	0.0	0.0	0.0	5.14
Alternative-6	0.0	0.0	0.0	0.0

Table 4: 8-stage North-Low strategy

Alternative/Group	1	2	3	4
Alternative-1	88.24	72.30	79.03	59.49
Alternative-2	0.0	0.0	0.0	0.0
Alternative-3	0.0	0.0	0.0	0.0
Alternative-4	11.76	27.70	20.97	40.51
Alternative-5	0.0	0.0	0.0	0.0
Alternative-6	0.0	0.0	0.0	0.0

Table 5: 8-stage South-High strategy

Alternative/Group	1	2	3	4
Alternative-1	85.36	71.06	76.23	57.97
Alternative-2	0.0	0.0	0.0	0.0
Alternative-3	0.0	0.0	0.0	0.0
Alternative-4	14.64	28.94	23.77	42.03
Alternative-5	0.0	0.0	0.0	0.0
Alternative-6	0.0	0.0	0.0	0.0

Table 6: 8-stage South-Medium strategy

Alternative/Group	1	2	3	4
Alternative-1	72.24	64.23	64.23	50.37
Alternative-2	0.0	0.0	0.0	0.0
Alternative-3	0.0	0.0	0.0	0.0
Alternative-4	27.76	35.77	35.77	49.63
Alternative-5	0.0	0.0	0.0	0.0
Alternative-6	0.0	0.0	0.0	0.0

Table 7: 8-stage South-Low strategy

5 Conclusion

Global outsourcing is a common practice now. Everyone talks about it and is a popular business topic. India and China are mentioned among the few potential destinations for outsourcing, because of its skilled and low-cost human resource. Multinational firms are making several efforts to exploit these opportunities, but most of them are unsuccessful due to various reasons. These lead the firm to evaluate between the possible FDI-Outsourcing alternatives and come up with the right choice to maximise the returns. Integrating tax policy with the sourcing alternatives can achieve powerful results. Inspite of the importance of this strategic problem, only over the past few years economists and business analysts have started looking at it in an analytical way. We feel that our paper is of immense practical utility for companies to make optimal decisions between FDI and outsourcing by taking into account the tax liabilities at various stages of its supply chain to reduce costs and satisfy the demand for its products or services in different countries (or regions). Our model incorporates most of the relevant features and depending on the application others can be included.

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