Global Financial Model for the Value Chain

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Abstract

The objective of this paper is to describe how a valuation decision model for a firm in a multi-country environment can be used to determine the optimal value chain. The paper extends the works of Rainish and Mensz (2012) to examine how a global firm can optimize their value chain and how it changes when various key factors (e.g. labor costs, transportation costs and transfer price tax rates) change in value. The model developed by Rainish and Mensz integrates the buy or builds decision, the location of production, distribution decision and tax effects into the capital investment decision of the firm. The model shows that a firm's production decision (buy or build), the customer location and tax effects are interdependent. The model to optimize the value of the firm is a function of the interdependencies of the input and financing factors. The paper also briefly discusses its implications on government policy for the economy and the firm.

Keywords: Global Capital Investment, Value Chain

1. Introduction

The objective of this paper is to describe how a valuation decision model for a firm in a multi-country environment can be used to determine the optimal value chain. The paper extends the works of Rainish and Mensz (2012) to examine how a global firm can optimize their value chain and how it changes when various key factors (e.g. labor costs, transportation costs and transfer price tax rates) change in value. The model developed by Rainish and Mensz integrates the buy or builds decision, the location of production, distribution decision and tax effects into the capital investment decision of the firm. This paper demonstrates the validity of the model's use in optimizing the value chain and how the location of production changes given changes in the various input factors. The paper also briefly discusses its implications on government policy for the economy and the firm.

2. Review of the Literature

The Rainish and Mensz paper developed a global financial valuation model that describes a valuation decision model for a firm in a multi-country environment. The paper extended the works of Myers (1974), Myers and Pogue (1974) and Lev (1974) to include individual investment project decisions to the global marketplace. The model integrated the make or buy decision, the location of production, distribution decision and tax effects into the capital investment decision of the firm. The model showed that a firm's production decision (make or buy), the customer location and tax effects are interdependent. The model to optimize the value of the firm is a function of the interdependencies of the operational and financial factors. It further showed that significant modifications are required of the traditional theories used for the determination of a firm's capital structure and cost of capital. The paper also extended the valuation model to include the impact of location and outsourcing on a firm's operational and investment activities.

A recently study by Deloitte (2013) showed that labor costs, labor productivity and corporate tax rates are significant factors in determining country competitiveness and in developing a country competitiveness index. The Boston Consulting Group (Sirkin, Zinser, and Rose (2014)) in a study developed a measure of manufacturing competitiveness that included four direct economic indicators. The four factors were wages, productivity growth, energy costs and currency exchange rates.

3. The Model

The Rainish and Mensz paper used as its foundation the net present value (NPV) financial model. The NPV model is used by firms for their investment decision as well as by investors to determine the value of a firm. The NPV model is described as follows:

Let assume that value of the firm (VF) is derived from its *n* various investments/projects

$$VF = \sum_i NPV_i$$

and each investment *i* currently generates cash flows from its various j activities denoted by CF_{ij} or is expected to be in operation in future.

Value of the firm can now be expressed as sum of the present value of ongoing operations and the net present value of new and future investments

$$VF = \sum_i NPV_i = \sum_i \sum_j PV(CF_{ij}) + \sum_i NPV(future) \qquad (1)$$

Where

$i = 1, 2, \ldots n$ and

$j = 1, 2, \ldots m_i$.

CF = Free After-tax Cash Flow

The Rainish and Mensz paper extended the model to a global operational framework where it was assumed for simplicity, that the new investments are relatively independent of current operations. Therefore, one can ignore the effects of the future investments and examine only the first part of the equation (1). Further, the calculation of the present value for each activity *j* for investment *i* uses each activity's discount rate that depends on the riskiness of each activity's cash flow.

The model was further expanded to allow for ownership and location of individual activities. Let *k* and *l* denotes binary variables, where *k* = 1 for own or make the activity, *k* =2 for buy (outsource, lease, etc.), *l* = 1 for domestic and *l* = 2 foreign location (variable *l* can be further expanded to include more specific continent or economical region, but for the sake of simplicity only two options are considered). The value of the investment *i* can be now expressed as follow:

$$NPV_i = \sum_j \sum_k \sum_l PV\ (CF_{ijkl}) \qquad (2)$$

Equation (2) represented the aggregate model showing the value of investment *i* as the sum of the NPV of the activities for the investment that recognizes the activities can be a blend of owned, bought, domestic and foreign activities

Instead of using aggregate cash flows of a firm's investments, the model was made more operational by expressing it in terms of revenues, costs (variable and fixed), accounting effects, taxes and already introduced ownership and location of the individual activities.

Cash Flow Definition of Investment *i*

Definition of Symbols:

R = Revenue of an Investment

VC = Variable Cost for Investment (includes taxes on production activities)

FC = Fixed Cost for Investment

Dep = Depreciation for Investment

NCF – Non-cash flow accounting adjustment effects for an investment t = income tax rate for investment activity j

P = price for product or service of investment

Q = quantity of product or service sold of investment

CapEx = capital expenditures for investment for investment dependent on current operations

TVC = total variable cost for investment *i.*

Note: Income tax rate t is assumed to incur at location of customer sales c. In practice would depend on multi-country income tax systems as applied to the firm for cross-border transactions (domestic and international).

Value of the investment *i* can be now expressed as follow:

$$NPV_i = \sum_j PV(CF)_{ij} = \sum PV[[(R_{ij} - TVC_{ij} - FC_{ij} - Dep_{ij})*(1 - t_{ij}) + NCF_{ij}] - CapExp_{ij}] \qquad (3)$$

Or

$$NPV_i = \sum_j PV(CF_{ij}) = \sum PV[[[Q_{ij}(P_{ij} - VC_{ij}) - FC_{ij} - Dep_{ij}]*(1 - t_{ij}) + Dep_{ij}] - CapEx_{ij}] \qquad (4)$$

The above expressions represent an aggregate model. They do not show explicitly differences in cash flow between buy-own decisions *k*, location decisions *l*, and tax differentials depending on the *k* and *l* selected for activity *j*.

Let's assume now, that revenue, price and quantity are in fact dependent on the k or l selected. This allows us to isolate the impact of the location and outsourcing on the value of an investment.

The equations (3) and (4) can be now expanded to the following form:

$$NPV_i = \sum_j PV(CF_{ij}) = \sum_j \sum_k \sum_l [[(R_{ij} - TVC_{ijkl} - FC_{ijkl} - Dep_{ijkl}) * (1 - t_{ijkl}) + NCF_{ijkl}] - CapEx_{ijkl}] \quad (5)$$

Or

$$NPV_i = \sum_j PV(CF_{ij}) = \sum_j \sum_k \sum_l [[Q_{ijkl}((P_{ij} - VC_{ijkl}) - FC_{ijkl} - Dep_{ijkl}) * (1 - t_{ijkl}) + NCF_{ijkl}] - CapEx_{ijkl}] \quad (6)$$

The above equations show that the cash flow of an investment *i* can vary depending on the blend of the *k* and *l* selected. At this stage, it is also assumed, that price and quantity are not dependent on selected location and ownership (different *k* and *l*). This assumption can be further relaxed by including effects of interactions of these two variables. The complete generalized model is an APV model that includes the value and the interactions of all of the firm's activities rather than only the financial effects.

The model showed that VC (*kl*), FC (*kl*), T (*kl*), NCF (*kl*) and CapEx depend on the *k* and *l* selected. The selected *k* and *l* are a function of both the previous stand-alone operational costs (e.g. administrative, production and investment) as well as the impact of the cost to the firm to deliver the products to their customers. The was shown to be a function of the following components: the production of the goods or services decision (own or buy; location of customers and production facilities; and comparative location costs); the cost to monitor production; the value of real options (strategic, abandonment and scalar); the value or cost of governmental environment; the value of financing effects; and the value of interaction effects (the efficiencies of the economies of scale and structure of various factors (taxes, financing, multiple product line logistic interactions, etc., of the value chain).

In summary, the maximization of a firm's value is a function of the portfolio of activity weights of the *k* and *l* selected. A summary of the APV model is described below. Please note that the model is not an all inclusive description of possible additional benefits and costs for the globalized model.

Value of investment *i* or APV(*i*) can now be expressed as:

$$APV_i = \sum_j PV(CF_{ij}) = \left[\sum_j \sum_k \sum_l \left(\sum_c Q_{ijklc} * (P_{ic} - VC_{ijkl}) - FC_{ijkl} \right) \right] * (1 - t_i) + \sum_j t_i Dep_j +$$

$$+ \sum_i \sum_j \sum_k \sum_l (NCF_{ijkl}) \quad + \sum_i \sum_j \sum_k \sum_l (TS_{ijkl}) \quad - \sum_i \sum_j \sum_k \sum_l (CapEx_{ijkl})$$

+ Cost of monitoring + Value of Real Options + Value of Government Environment + Value of Interactions from Non-Long-term Financing Effects and Operations (7)

Where, *TS* is the incremental present value of the net tax savings from the interest deductibility of the firm's debt financing and its cost of financial distress.

Where, t_i is an aggregated tax rate calculated as a weighted average tax rate at the customers' locations. The weight used is the ratio of the marginal profitability at the customer location to the total marginal profitability related to the investment *i*

$$t_i = \sum_c w_c * t_{ic} = \sum_j \sum_k \sum_l (P_{ic} - VC_{ijkl}) * Q_{ijklc} * t_{ic} / \sum_j \sum_k \sum_l \sum_c (P_{ic} - VC_{ijkl}) * Q_{ijklc}$$

The APV can be used as the objective function for the mathematical programming model that determines the set of decisions that maximizes the value of the firm. The model allows for the interaction between the operational variables as a separate value component or included in the value of the affected component. It also allows for different prices for each product to each customer. The changes in price can have an impact on the quantity demanded by customer *c*. The impact of changes in price and quantity, and customers can impact the buy-own, location and tax decisions for activity j as well as the other added variables. The relaxation of the independence between price and quantity can increase the firm's value if the cost of delivery to the customer their good or service is reduced and if the quantity of demand for the product is elastic. The relaxation of the location assumption increases the complexity and monitoring costs but does allow a firm to value the complete supply chain from raw materials to delivery of the good and service to the customer.

4. Discussion of Global Value Chain Tax Accounting and Data Uses in Analysis

A firm's decision to establish a global supply chain in a specific country or region is often predicated on a combination of financial and non-financial variables. Non-financial variables may not be easily to quantify and accordingly are not considered relevant in this model. The data used in the model was extrapolated from the financial statements of a publicly traded multinational corporation (subject company) and modified slightly in order to preserve anonymity. The financial variables which this model considers relevant are discussed below:

Transfer pricing provides the vehicle for multinational firms to shift profits from high tax jurisdictions to lower tax jurisdictions. This effectively reduces the tax burden which in effect increases value by increasing overall profitability and value (Adams and Dirtina, 2010). Broadly defined, transfer prices are the amounts charged for goods and services exchanged between divisions or units of the same company. The universally accepted approach for setting a transfer price is referred to as the arms-length standard. The arms-length pricing standard reflects the price at which two unrelated parties agree to execute a transaction in an open market transaction. Despite the fact that countries worldwide use the arms-length standard to set transfer prices, they enact rules that can lead to different interpretations of what the price or the standard would be. Therefore, meeting the rules of one country does not guarantee that the other's requirements will be met (Mutti and Grubert, 2004). For the purpose of this study the subject company utilized a transfer pricing strategy that utilized a 15% of variable cost structure. Using that structure combined with the blended regional taxes rates a baseline net income or see-through profit of US$5 per unit within each region was achieved. Indirect taxes such as VAT are considered neutral and have not been considered in setting the transfer price.

Materials consistent with the subject company data have been estimated to be US$15 per unit and have been considered to be constant throughout the regions. Additionally, any indirect taxes are considered to be included in the materials cost.

Average manufacturing wage is a significant variable to be considered in supply chain risk management since wages form an integral part of the products that are purchased or in the case of raw materials extracted. A regional a cross section of countries from the subject company's segment data was used to develop an average manufacturing wage rate. When applying average manufacturing wages to supply chain management, it should be noted that further study would be necessary to develop a trending analysis since wages are not a static commodity. Labor rates have been adjusted for any estimated social taxes. The study considers costs as labor costs per unit.

International transportation costs are dependent on many factors but as noted in Hummel's (n.d) can be problematic when reviewing the price of goods at origin and price at destination. In a simplistic view, transportation costs for a product are a function distance, method and weight. Additionally, quality of transport and pricing of goods are also factors. A preliminary review of existing literature indicated that no comprehensive work relating to global transportation rates exists. Consistent with subject's company's data the study considered products were shipped FOB Destination to the United States and an extrapolated a rate based on the price of WTI crude oil at the range of US$70-102 per barrel. Any change outside of the range would require an additional readjustment.

Facilities charges were estimated and consist of theoretical capital consummation costs. For the purposes of this study these costs include rent, depreciation and insurance as well as a provision for the related indirect ad valorum taxes.

Taxes are considered to be a significant environmental variable for multinational organizations (Doupnik and Perera, 2012). Sovereign governments have the authority to tax businesses if an economic relationship exists International taxation generally refers to the tax treatment of cross-national transactions (Goodspeed and Witte, 1999). These tax alternatives include direct taxes such as corporate incomes tax which are structure orientated as well as indirect taxes such as sales, value-added, property, excise and a host of others (Desai, Foley and Hines, 2004).

Indirect Taxes also impact organizations that operate abroad, regardless of their structure. They will encounter a variety of different taxes (Choi and Meek, 2012). Indirect taxes are defined as charges levied by a jurisdiction on the consumption, expenditure, privilege or right. In a broad context these will include sales and use tax, Value Added (VAT), duties and customs, severance and a variety of other levy's that are less obvious than direct taxes as discussed below. Indirect taxes such as VAT are levied on the various stages of production. Severance taxes are associated with extraction activities most notable raw materials. Border taxes such as import and export duties are levied in order to stabilize pricing structures and sales or transfer taxes are levied on transactions between unrelated parties.

Indirect taxes are typically viewed as buried or hidden taxes and as such are infrequently disclosed. When considered in a supply chain management framework, indirect taxes can add significant cost to the flow of goods and services and accordingly need to be considered. For the purposes of this study indirect taxes are included in the respective variable costing.

Direct taxes are represented primarily by taxes levied on income and property. Based on how an organization structures its operations income can be taxed in many different jurisdictions. Regardless of the form an organization takes it may be subject to foreign income taxes. The concept of permanent establishment provides in part that if an organization has a physical presence or an economic connection in a jurisdiction it may be subject to a deemed branch profits tax. In general the existing system of treaties and protocols will mitigate any potential double taxation issues. When viewing direct taxes from a supply chain management perspective, direct taxes will have much less of an impact on operations when the treaty and protocol provisions and transfer pricing arrangements are applied.

For the purpose of this study the tax variable represents a blended regional rate of regionally paid direct taxes. No investment incentives have been included. The blended rates used for Asia, Europe and Latin America are 21%, 25% and 27% respectively. The study further assumes that any related indirect taxes as discussed above have been included in the respective variable costs as discussed.

Retained earnings variable as described above in the transfer pricing structure represents the residual or embedded profit that gets transfers as a function of the structure itself. In the case of the subject company the see through profit is reduced to a percentage and is compliant with global transfer pricing requirements. In approaching it this way the subject company has mitigated the impact of cross jurisdictional tax issues which may have impacted the specific tax variables.

5. Simplified Model to Demonstrate Value Chain Profit Sensitivity for Changes of Input Factors

For our case we are assuming that there are three foreign locations *"l"* producing a product for sale in the U.S. market. We are formulating the following maximization problem.

$$\max Netprofit = \sum_{l} Q_l * (P_{us} - TP_l)$$

Where:

P_{us} – price in the United States

TP_l – Transfer Price from location l

Q_l – Quantity produced in location l

Each TP_l, which can be also interpreted as variable cost at the delivery in US is calculated as sum of all factors which contribute to the variable cost adjusted by Transfer Tax .

$$TP_l = \sum_{i=1}^{7} C_{li}$$

Where

C_{l1} – material

C_{l2} – labor

C_{l3} – transportation

C_{l4} – facility charges

C_{l5} – local taxes

C_{l6} – retained earnings

C_{l7} – transfer tax calculated as

$$TP_l = \sum_{i=1}^{6} C_{li} * TR_l$$ where TR_l denotes the transfer tax rate for location l

In addition we assume a starting equilibrium state where each location has a capacity constraint of 100,000 units and total demand in the US is equal to 255,000 units which is 85% of the maximum total capacity.

So the following set of constraints must be satisfied:

$$Q_l \leq 100{,}000 \quad \text{for l=1, 2, 3}$$

$$\sum_{i=1}^{3} Q_{li} \leq 255{,}000$$

6. Case Analyses

The factors selected for the sensitivity analysis were based on the results of the studies by the Boston Consulting Group and Deloitte. The results of the various cases will attempt to measure the implications of their conclusions.

Base Case

Our base case represents no preferences scenario with equal profitability in all three locations and capacity set up to 85% of the maximum.

	Asia	Europe	Latin America
Price in US/unit	45	45	45
Variable costs ($US rounded)			
Materials	15	15	15
Labor	7	10	8
Transportation	4	2	3
Facility charges	3	2	3
Taxes	2	2	2
Retained Earnings	5	5	5
Total Variable costs	36	36	36
Tr. Tax Rate	0.15	0.15	0.15
Tr.Tax ($)	5.4	5.4	5.4
Calc.Tr. Price	41.4	41.4	41.4
Net income/unit	3.6	3.6	3.6

Implications: Given constrains on capacity as long as net incomes are positive solution will not be affected.

RESULT: As expected the results of this case is equal production in all 3 locations

Location	Asia	Europe	Latin America
Profit/location	306000	306000	306000
TOTAL Profit	918000		

Case 1

For case 1 we relaxed capacity constraints to maximum in all locations and decreased Transfer tax rate in Europe from 15% to 10 percent. This automatically increased profitability in Europe.

	Asia	Europe	Latin America
Price in US/unit	45	45	45
Variable costs ($US rounded)			
Materials	15	15	15
Labor	7	10	8
Transportation	4	2	3
Facility charges	3	2	3
Taxes	2	2	2
Retained Earnings	5	5	5
Total Variable costs	36	36	36
Tr. Tax Rate	0.15	**.1**	0.15
Tr.Tax ($)	5.4	5.4	5.4
Calc.Tr. Price	41.4	41.4	41.4
Net income/unit	3.6	5.4	3.6

Implications: The preferable location to produce is now Europe. Asia and Latin America produce balance of the demand. That means that symmetrical solution Asia – 55,000 and Latin America -100, 000would generate the same total net income.

As long as the cost/unit difference (TP) between Europe and other locations will not decrease by more than $1.8 the solution stay the same

RESULTS: Given equal net income/unit in Asia and Latin America we received multiple solutions.

Location	Asia	Europe	Latin America
Profit/location	100000	100000	55000
TOTAL Profit	1090000		

Case 2

For case 2 we relaxed capacity constraints to maximum in all locations and increased labor cost in Asia from $7 to $9. This automatically decreased profitability of Asia as compare to Europe and Latin America.

	Asia	Europe	Latin America
Price in US/unit	45	45	45
Variable costs ($US rounded)			
Materials	15	15	15
Labor	**9**	10	8
Transportation	4	2	3
Facility charges	3	2	3
Taxes	2	2	2
Retained Earnings	5	5	5
Total Variable costs	38	36	36
Tr. Tax Rate	0.15	.15	0.15
Tr.Tax ($)	5.7	5.4	5.4
Calc.Tr. Price	43.7	41.4	41.4
Net income/unit	1.3	3.6	3.6

Implications: The preferable locations to produce is now Europe and Latin America. Asia as less profitable produces only balance of the demand.

As long as the cost/unit difference (TP) between Asia and other locations will not decrease by more than $2.3 the solution stay the same

RESULTS: Given higher net income/unit in Europe and Latin America solution calls for maximum production in these locations and only balance in Asia.

Location	Asia	Europe	Latin America
Profit/location	100000	100000	55000
TOTAL Profit	791500		

Case 3

For case 3 we relaxed capacity constraints to maximum in all locations and increased transportation costs at all locations by 20%. This will most impact Asia as the most remote location from the market in US.

	Asia	Europe	Latin America
Price in US/unit	45	45	45
Variable costs ($US rounded)			
Materials	15	15	15
Labor	7	10	8
Transportation	**4.8**	**2.4**	**3.6**
Facility charges	3	2	3
Taxes	2	2	2
Retained Earnings	5	5	5
Total Variable costs	36.8	36.4	36.6
Tr. Tax Rate	0.15	.15	0.15
Tr.Tax ($)	5.52	5.46	5.49
Calc.Tr. Price	42.32	41.86	42.09
Net income/unit	2.68	3.14	2.91

Implications: The preferable location to produce is now Europe and Latin America.

As long as the cost/unit (TP) in Europe will not go up by more than $0.46 the solution stays the same.

Similarly, as long as the cost/unit (TP) in Latin America will not go up by more than $0.23 the solution stay the same

RESULTS: Similar to the case 2, based on net incomes/unit, solution calls for maximum production in Europe and Latin America and only balance of demand in least profitable Asia.

Location	Asia	Europe	Latin America
Profit/location	55000	100000	100000
TOTAL Profit	752400		

Case 4A

For case 4a we relaxed capacity constraints to maximum in all locations and increased labor costs in Europe by 15%, from $10 to $15.

	Asia	Europe	Latin America
Price in US/unit	45	45	45
Variable costs ($US rounded)			
Materials	15	15	15
Labor	7	11.5	8
Transportation	4	2	3
Facility charges	3	2	3
Taxes	2	2	2
Retained Earnings	5	5	5
Total Variable costs	36	37.5	36
Tr. Tax Rate	0.15	.15	0.15
Tr.Tax ($)	5.4	5.625	5.4
Calc.Tr. Price	41.4	43.125	41.4
Net income/unit	3.6	1.875	3.6

Implications: The preferable location to produce is now Asia and Latin America.

As long as the cost/unit (TP) in Europe will not go up by more than $0.46 the solution stays the same.

As as long as the cost/unit (TP) in Asia or in Latin America will not go up by more than $1.725, or cost in Europe will not go down by the more than 1.725 the solution stay the same.

RESULTS: Similar to the case 2 and 3, based on net incomes/unit, solution calls for maximum production in Asia and Latin America and only balance of demand in least profitable Europe.

Location	Asia	Europe	Latin America
Profit/location	100000	55000	100000
TOTAL Profit	823125		

Case 4b

For case 4B we relaxed capacity constraints to maximum in all locations, increased labor costs in Europe by 15%, from $10 to $15, and increased transportation cost by 30% across all three locations

	Asia	Europe	Latin America
Price in US/unit	45	45	45
Variable costs ($US rounded)			
Materials	15	15	15
Labor	7	**11.5**	8
Transportation	**5.2**	**2.6**	**3.9**
Facility charges	3	2	3
Taxes	2	2	2
Retained Earnings	5	5	5
Total Variable costs	37.2	38.1	36.9
Tr. Tax Rate	0.15	.15	0.15
Tr.Tax ($)	5.58	5.715	5.535
Calc.Tr. Price	42.78	43.815	42.435
Net income/unit	2.22	1.185	2.565

Implications: The preferable location to produce is now Asia and Latin America. Solution is similar to 4A except that differences in profitability are smaller.

As long as the cost/unit (TP) in Asia will not go up by more than $1.04 the solution stays the same.

Similarly, as long as the cost/unit (TP) in Latin America will not go up by more than $1.38 the solution stay the same.

RESULTS: Similar to the case 2, based on net incomes/unit, solution calls for maximum production in ASIA and Latin America and only balance of demand in least profitable Europe.

Location	Asia	Europe	Latin America
Profit/location	100000	55000	100000
TOTAL Profit	543675		

Case 4C

For case 4B we additionally increased cost of labor in Asia by 20%.

	Asia	Europe	Latin America
Price in US/unit	45	45	45
Variable costs ($US rounded)			
Materials	15	15	15
Labor	**8.4**	**11.5**	8
Transportation	**5.2**	**2.6**	**3.9**
Facility charges	3	2	3
Taxes	2	2	2
Retained Earnings	5	5	5
Total Variable costs	38.6	38.1	36.9
Tr. Tax Rate	0.15	.15	0.15
Tr.Tax ($)	5.79	5.715	5.535
Calc.Tr. Price	44.39	43.815	42.435
Net income/unit	0.61	1.185	2.565

Implications: The preferable location to produce is now Europe and Latin America. Solution is similar to Case 3 except that the most profitable location is now Latin America.

As long as the cost/unit (TP) in Asia will not go down by more than $0.57 the solution stays the same.

Similarly, as long as the cost/unit (TP) in Europe will not go up by more than $0.57 or cost/unit (TP) in Latin America will not go up by more than $1.968 the solution stay the same.

RESULTS: Increase in transportation costs and labor affected costs in all three locations but Asia became LEAST profitable.

Location	Asia	Europe	Latin America
Profit/location	550000	100000	100000
TOTAL Profit	4085550		

7. Implications, Summary and Conclusions

This paper describes how a valuation decision model for a firm in a multi-country environment can be used to determine the optimal value chain. The paper extends the works of Rainish and Mensz (2012) to examine how a global firm can optimize their value chain and how it changes when various key factors (e.g. labor costs, transportation costs and transfer price tax rates) change in value. The paper examines the models sensitivity and how it can accommodate changes in the value of the various inputs to maximize the value chain. The paper shows that changes in all input variables including governmental tax policies will impact the production location decision of a multinational firm.

8. References:

Adams, L., and Drtina, R, (2010). Multinational Transfer Pricing: Management Accounting Theory versus Practice, Management Accounting Quarterly 11(3) P 22+

Allen, S, Echevarria, and Wince-Smith D., "2013 Global Manufacturing Competitiveness Index," Deloitte (2013)

Brealey, R.A., S.C. Myers and F. Allen, 2006, Principles of Corporate Finance, McGraw-Hill, New York.

Burstein, A. and A. Monge-Naranjo, "Foreign Know-How, Firm Control, and the Income of Developing Countries," U.C.L.A., 2007.

Choi, F. and Meek, G., (2012). International Accounting (7e), Upper Saddle River, NJ, Prentice Hall Publishing

Desai, M., Foley, F. & Hines, J., (2004), Foreign Direct Investment in a World of Multiple Taxes, Journal of Public Economics, 88 (2004) 2727-2744

Dirtina, R., and Reimers, J., (2009), Global Transfer Pricing: A Practical Guide for Managers, SAM Advanced Management Journal, Volume 74, Issue 2, P 4+

Doupnik, T and Perera, H., (2012). International Accounting (3rd), New York: McGraw-Hill Irwin

Fantasia, J., "Can Today's Supply Chain Deliver Tomorrow?" Deloitte, (2009).

Goodspeed, T. and Witte, A., (1999), International Taxation, Encyclopedia of Law and Economics, 253

Grove, A., "Andy Grove: How America Can Create Jobs," Business Week, July 1, 2010.

Holmes, T and J. Schmitz, "Resistance to New Technology and Trade between Areas," Minneapolis Federal Reserve Bank Quarterly Review, 19 (1995), Issue 1.

Lev, B., September 1974, "On the Association between Operating Leverage and Risk," Journal of Financial and Quantitative Analysis 9, pp. 627-642.

Mankiw, N. G. and P. Swagel, "The Politics and Economics of Offshore Outsourcing," NBER Working Paper 12398, July, 2006.

McGrattan, E and E.C. Prescott, "Openness, Technology Capital, and Development," Working Paper 651, April (2007).

Miller, Merton, 1977 May, "Debt and Taxes," Journal of Finance, pp. 261-275.

Modigliani, F. and M.H. Miller, 1958, "The Cost of Capital, Corporation Finance and the Theory of Investment," American Economic Review 48, pp. 261-297.

Modigliani, F. and M.H. Miller, 1963, "Corporate Income Taxes and the Cost of Capital: A Correction," American Economic Review 453, pp. 443-443.

Mutti, J. and Grubert, H., (2004). Empirical asymmetries in foreign direct investment and taxation Journal of International Economics, 62(2), 337-358 Retrieved, August 12, 2010, from Research Library. (Document ID: 640644721).

Myers, S.C., 1974 March, “Interactions of Corporate Financing and Investment Decisions – Implications for Capital Budgeting,” Journal of Finance, pp. 1-25.

Myers, S. C., D. A. Dill and A. J. Bautista, 1976, June, "Valuation of Financial Lease Contracts," Journal of Finance, pp. 799-819.

Myers, S.C. and G.A. Pogue, 1974, May, “A Programming Approach to Corporate Financial Management, Journal of Finance 29, pp. 579-599.

Rainish, R. and P. Mensz, "Financial Framework for Global Investment and Implications," American International Journal of Contemporary Research, Vol. 2 No. 3; March 2012

Samuelson, Paul A. 2004 Summer. “Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization,” Journal of Economic Perspectives, Vol. 18, No. 3, pp. 135-146

Schauten, M. and J. Spronk, Optimal Capital Structure – Reflections on economic and other values, 2006, working paper

Sirkin, H., M. Zinser, and J. Rose, “The Shifting Economics of Global Manufacturing,”
Boston Consulting Group (2014)

Wright, J., Jones D. and Hoyle S., "The Sustainable Supply Chain," Accenture, (2009)