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Modeling Financial Criteria for Decisions of Delocalization: Case Study and Managerial Insights

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Abstract

In order to maintain their level of competitiveness in the globalized market, multinational firms are undeniably confronted to make strategic choices to increase their profit and ensure their sustainability. The re-design of multinational groups by the relocation of a part of their supply chain or the totally of it to other countries are among the crucial decisions of the supply chain management. We provide the most important factors that drive the Multinational firms to delocalize. Through this article we define an analytical model of decision making tool for delocalization taking into account the financial constraints of potential destinations. We present then new financial guidelines and recommendation by the Organization for Economic Cooperation and Development (OECD) in terms of profitability and cost allocation. Through a case study of tangible and intangible activities, we evaluate the impact of financial policies and specially the transfer pricing policies on the amount of manufacturing capacity to relocate. We give managerial insights ad new directives to be explored for feature works in the context of delocalization.

Keywords
Capacity relocation, Supplier management, Decision making tool, Supply chain design, Transfer pricing.

1. Introduction

Today companies seek profit maximization and have to adopt restructuring strategies that include relocation in order to ensure their sustainability. In general terms, delocalization is the relocation of capacities of production abroad mainly to low cost countries while the final product is redirected to the same market. The goal is not a market expansion but essentially to take advantage from lower labor expenses and many factors such as the attractive economical political environment as well as the legal/regulatory environments of the host countries. Therefrom the concept of delocalization has been raised in order to identify the operations in which the production is ensured inside the group but abroad by its own subsidiaries (OECD, 2004). Once relocated, the group will be composed of a parent company and other subsidiaries located abroad and exchanging both goods and services. The values of these traded goods are valued in terms of transfer price (TP).

Borkowski (1997) define the Transfer price as the strategy for pricing tangible goods and intangible services transferred between parent and subsidiaries, or between subsidiaries, to maximize profits, minimize taxes, maintain goal congruence and/or evaluate managerial performance. O'Connor (1997) stated that transfer pricing is the most important international tax issue facing multinationals today, and is expected to remain so far for the near future. In fact, the transfer price has a major impact on firm's revenues and may contribute to divergent results according to the

method of its evaluation. Consequentially, the decision to transfer activities and capacities may change according the best profit offered by each scenario. Hence, we emphasize the examination of transfer price (TP) strategies that govern transactions between affiliates. We also give prominence to the impact of the new financial requirements that have been raised by the Organization for Economic Cooperation and Development (OECD) in 2015. We seek to determine the optimal decision that provides more profit for the global company, by integrating these new constraints in a more global decisional model.

The remainder of this article is organized as follows: In Section II, we present dimensions of the decisional model of delocalization that are considered in the literature. Section III is dedicated to the description of the requirements of the OECD in terms of Transfer pricing and the new financial challenge introduced by the Base Errosion and Profit Shifting (BEPS) project. In Section IV, we present the objective function of the model and it is application through a case study.

2. Dimensions of the delocalization decision model and its different variables

The management of supply chains by facility location, as confirmed by (Melo et al., 2005) is taking increasingly more importance.
The review of contemporary business literature, confirms to us the existence of relationship between fiscal factors and decisions of supply chain design. Indeed, (Shunko et al., 2014) show how companies can use the transfer pricing as a decisive element for shifting incomes to countries that have low tax rates in order to maximize the overall profit after taxation.
The primary step is to recognize the different characteristics impacting the model. In fact, these characteristics were summarized by Hammami et al. (2008) and were classified under four axes as mentioned Bellow:

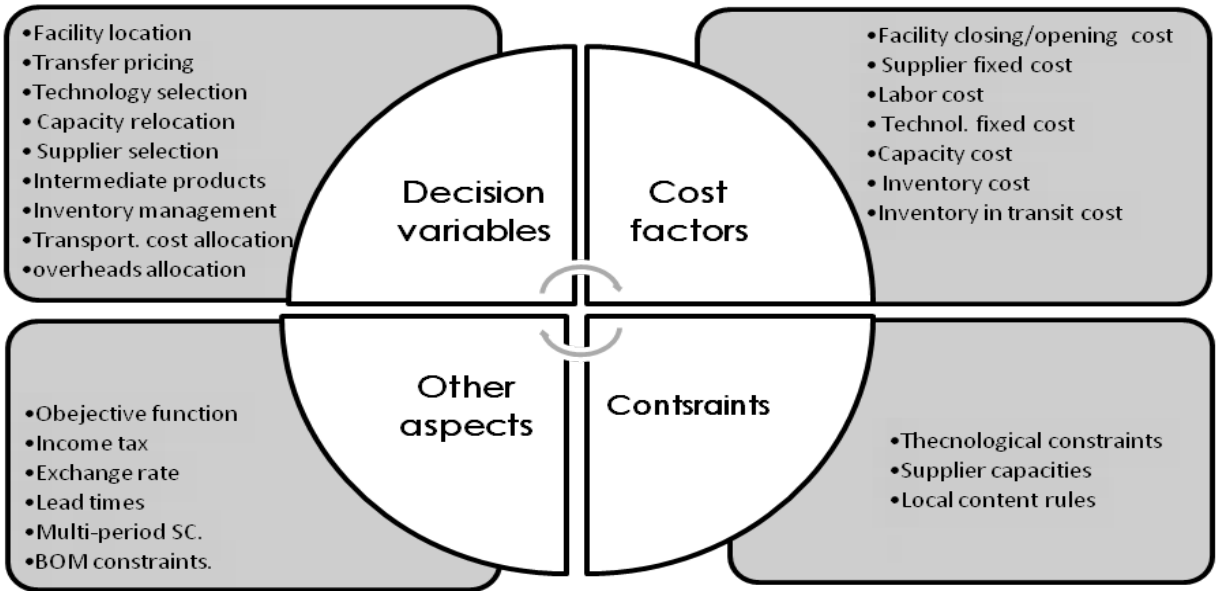

Figure 1. Classification of the 25 characteristics of the existing models of supply chain design

The purpose of this paper is to mark out the impact of the new fiscal conditions on the decisional model and on the conception of the conception of supply chain in the context of delocalization. In fact, the TP methodologies are subject to many factors that have been recently introduced by the BEPS project in 2015 (pwc2016) and (Osler 2015).
The decision-making model of supply chain design in the context of delocalization was interpreted in the literature by many works as was mentioned by the literature review of M. Benfssahi & Z. Elfelsoufi (2016). Figure 2 shows also the efforts of authors towards a more global model that covers a maximum of characteristics mentioned previously.

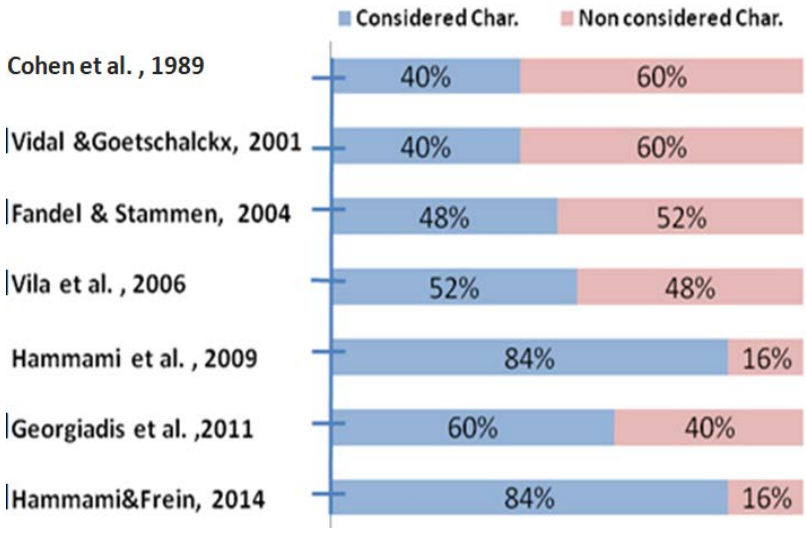

Figure 2. Summary of works integrating transfer pricing in their decisional model in the context of delocalization.

The contribution of our work is to cover the gaps seen in the current established models by proposing new constraints added by the OECD. In order to formulate these constraints, it will be necessary to have first a look on existing classic methods for TP evaluation.

3. OECD requirements in term of transfer pricing

3.1. Transfer pricing methodologies:

The OECD plays a role of a consultative assembly whose members are the 35 most developed countries (USA, Canada, Australia, South Korea, European Union members, etc.). Since the approval of OECD transfer pricing guide in 1995, five methodologies for TP assessment were introduced (OECD, 2010). Those methodologies are as following:

- Traditional methods based on transactions: Comparable Uncontrolled price Method, Cost plus Method, Resale minus Method. Those three methods are more convenient for calculating transfer price of Tangible Goods and services.
- Transactional methods based on profitability: Transactional Net Margin Method (TNMM), Profit Split Method (PS). In order to cover a large part of companies we use the methods based on profitability, since they are more adequate for both tangible and intangible goods and services.

In this article we aim to compare the TNMM to the profit split method, and to analyze the impact of the advanced pricing agreement on firm profit while using these methods.

3.2. New requirements of BEPS project:

On 5 October 2015, the OECD has published its final reports regarding to the project against erosion of the tax BEPS. The goal of the project is to increase the consistency, substance and transparency of the international tax system. Indeed, it has turned the balance of power towards the tax authorities and has upset the world economy by limiting the ability of multinational firms to decide on which site to allocate their profits. The recommendations of the BEPS project revolve 15 actions (pwc2016) and (Osler 2015). The most important actions concerning the transfer pricing are listed below:

- Advance Pricing Agreement -APA: Improve the fight against harmful tax practices, taking into account transparency and substance. BEPS project recommends to sign up in advance a unilateral and transborder agreement about any decision related to the transfer pricing. The goal is to ensure legal security and fiscal stability for relocated firms.

- Elimination of Double Taxation: Prevent the granting the profits of fiscal conventions when it is inappropriate to assign these profits. This is an agreement between two different countries for evasion of tax fraud by eliminating double taxation about taxes on incomes and capital.
- Intangible allocation: Develop rules that prevent the erosion of the tax base and the transfer of profits through the transfer of intangible assets between members of the same group. Indeed, the profit resulting from the exploitation of intangible assets shall be distributed between the entities that contribute to the creation of the intangible. The legal ownership is no more enough.
- Risks allocation: Develop rules that prevent the erosion of the tax base and the transfer of profits through assignment of an excessive capital of risk to some subsidiaries of a group. This implies that it is not possible to decide on the allocation of risk via purely intra-group contracts. The risk assumed by a subsidiary must be assessed according to the level of control it has over its decisions.
- Redefinition of transactions: if a transaction between two subsidiaries does not comply with commercial rationality, tax authorities have the ability to substitute intra-group contract with new terms that are more in line with economic rationality.

4. Mathematical Modeling

4.1. Presentation of parameters

The model proposed is a mixed integer linear programming model which is concerned with the problem of Supply chain network design. It is inspired from last works of Hammami (2014).

We assume that for an original firm, the supply chain of suppliers, manufacturers and distributors is already established. The model will propose the production volume and capacities rate that will be transferred to alternative sites. We denote by:

i: an affiliate firm from combination of alternative sites;

f: a supplier from potential suppliers;

k: a customer from group of Customers.

The transferred products among the supply chain are either a raw material (m), or a half-finished product (r) or a finished product (s).The decision variables linked to sells are:

npi: quantity of product P manufactured at affiliate i;

nrij: quantity of product r transferred by i to an affiliate j;

nsik: quantity of products s sold by site i to customer k;

pt(r,i,j): unit price of transferred product r from site i to j;

PV(s, i, k): selling price of product s by site i to customer k fixed by the market.

SM_{fi} : fixed cost of managing supplier f in period t.

Y_{fi}: equales 1 if site I assume SM services of supplier f .

We can then formulate the total profit of site i, using the standard currency, for a period t as:

$$\Pr(i) = \sum_k \sum_s n_{sik} \times PV(s,i,k) + \sum_r \sum_j \left[n_{rij} \times pt(r,i,j) - n_{rji} \times pt(r,j,i)\right] - \sum_f SM_{fi} \times Y_{fi} - \sum_r Invr(i) - \sum_r opr(i) \quad (1)$$

where:
Pr(i) is the profit earned by site i;
Invr(i) is the total cost of investment per each product r which includes implementation of new activities, capacities acquisition from other affiliates or external source, integration of new suppliers, sites closure costs and opening cost of new sites due to delocalization;
Opr (i) is the total operating cost per each product r that encompasses the cost of direct operations: using an activity, labor cost, production costs, engineering activities cost, purchasing costs of raw materials and transport.
It is judicious to mention that the transport cost of raw materials, from external suppliers to site i, is included in

purchase price. However, the cost of transport between two affiliates of same group i and j is not included in the TP and it is ensured by the receiving site.

4.2. Objective Function :

According to (1), the profit of the site i depends on the TP fixed for all intermediate products and also the amount of transactions between affiliates. The global profit of the group will be the sum of all generated profits by affiliates i.
We denote also by:
GPAT: the global profit after tax deduction.
Ti: the imposition rate on profit expressed in percentage.
Di: the conversion rate from currency of site i to its value in standard currency.
Then, the global profit expresses as:

$$GPAT = \sum_i [(1 - Ti).Di\ .\Pr(i)] \quad (2)$$

Equation (2) shows well the relation between global profit GPAT and taxations imposed Ti by host countries as well as the currency conversion for each country Di. The model can then manipulate these parameters in order to generate the maximum profits by shifting revenues to low tax countries.

We deduce the objective function of the model:

$$Max\ (PG, IT) \quad (3)$$

Where IT is a time interval corresponding to the period of study.

4.3. Modelization of Main constraints:

4.3.1. Constraint of using PS Method:

For one fixed product r generating operating cost $Op_r(j)$.

$$\Pr\ (i) = \text{weight}\ (i) \times \text{GPAT} \quad (4)$$

Where:
$$\mathbf{Weig\square t(i)} = \frac{\mathbf{Di\ \ Opr(i)}}{\sum_{\mathbf{j}}\ \mathbf{Dj\ Opr(j)}]} \quad (5)$$

We can conclude the price of transfer pt(r,i,j) from the equation (1) .

4.3.2. Constraint of using TMNM:

For each fixed site i and a fixed product r sold to site j, the transfer price of product r is given by the formula :

$$pt(r,i,j) = (\ ProfitRate(i) +\ 1)\ \times Opr(j)) \quad (6)$$

Where ProfitRate(i) is a markup ratio fixed by the site i basing on benchmark comparison of similar activities in the market.
Basing on the resale price of the final harness and the markup ratio based on benchmarking, we conclude the transfer price.

$$Gross\ profit(1) = resale\ price(1) - Op(1) \quad (7)$$

Operating profit is a ratio of resale price determined basing on benchmarking of similar activities in the market.

4.3.3. Constraint of advanced price agreement(APA):

If APA was agreed by a firm within the host country for a fixed period IT corresponding to four years minimum, the firm can either use the PS method or TMNM.

Constraints (4 &5) cannot be used simultaneously with constraints (6&7) as they belongs to opposing methods.

We declare binary variables:

$\begin{cases} Yps = 1 \text{ when PS method is implemented;} \\ 0\ otherwise \end{cases}$

$\begin{cases} Ymn = 1 \text{ when TMNM is implemented;} \\ 0\ otherwise \end{cases}$

$$Yps + Ymn \leq 1 \quad (8)$$

Other constraints related to capacities installed in each site were taken in consideration for model simulation.

5. Case study

5.1. Assumptions and input data

We consider that a company in Romania nominated as site a manufactures a wiring harness for automotive. The process is decomposed into two kinds of activities:

- Production of the wiring harness (intermediate product): Cutting, semi-automated splicing, assembling and electrical controlling.
- Supplier Management: supplier training and support, production part approval process, conducting laboratory tests and assessment of new raw materials, cost of feedback about feasibilities of new requirement of change, Design and risk assessment of new components.

The company has an optional possibility to open a new facility site B in another country that presents low tax jurisdiction. We propose to analyze the business case of a new site in North of Morocco.
For this case study the SM activities are automatically shifted to site B once the product in concern is delocalized to the host firm B.
Supplier Management Cost is doubled in case of choosing a new local supplier in site B due to additional cost related to training and manufacturing assessment.
We note by Pf the final price of product sold by site A and TP transfer price of intermediate product sold by site B.

We describe on Figure 3 the main flows of Supply Chain that are under consideration: cash flow and product flow in the context if site A (Romania) delocalizes a part of its production capacities to site A (Morocco).

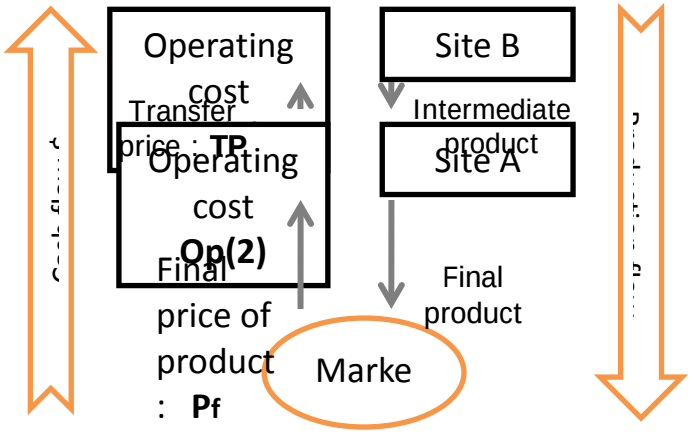

Figure 3. Flows of supply chain of the group

- Other assumption:

-number of product: 1
-Number of suppliers: 8
-Number of Raw Material:10
- Transportation cost of final product FP is ensured by the customer (according EXW agreement).
-Transportation cost for inter-transaction is ensured by the sender.
-No inventory stock, no waste of materials (quantity shipped equals quantity produced)
-Both sites have same operational performance, same volume of working hours per year.
-Exchange rate 1 € = 11,38DHs
-Activity implementation cost is not depreciated, as it is paid at first period.
-Capacity relocation (tools & workforce) is depreciated over 3 years.
-Depreciated cost of opening site is over 10 years.
The selling price of final product is P_f expressed in €. P_f does not include the transportation cost towards customer.
-Labor unit cost (Site B) < Labor cost (site A)

The Moroccan territory is giving an encouraging tax rate on income of 8.75% for all exporting companies installed at the industrial free Zones, while the income tax rate in original site is assumed to be 16%.
-APA is agreed between Morocco and Romania and fix the transfer pricing for multinational firms.

- We consider that both sites are on free zones and benefit for exoneration on paying value added taxes VAT.

-The other parameters and costs were generated based on realistic approach for the automotive sector while taking into account the disparities between Romania and Morocco.

-We use MatlabR2016a for generation of values of GPAT related to each scenario.

-Scenario1, 2, 3 and 4 correspond consecutively to the cases where delocalization from Romania to morocco is done by the rate of 0%, 25%, 50% and 100%.

5.2. Results and insights from the case study:

On Figure 4 we draw the average rate of GATP over 4 years for each used TP methodology. We compare the results of PS method vs the TNMM method. We conclude that by using the PS method, the best scenario to be chosen is Scenario 4(transfer of 100% of production capacities) as it realizes an increase of 17% of the GATP. While the same scenario does not provide optimal results in the case of using TNMM method. In fact the GATP reaches its maximum 16% in the case of scenario 2.
Thus we conclude the impact of the method used for transfer pricing on the decision of capacities transfer and also on the amount to be transferred.
It will be interesting to markup also the impacts of the OECD new constraints on the decision of delocalization.
For instance, let's cancel the assumption of the existence of APA agreement between Morocco and Romania. Firms will be free to adopt a different methodology for each period.
We consider that at Period 1 & 2: company used PS method while at Period 3 & 4: it was decided to use TNMM method.

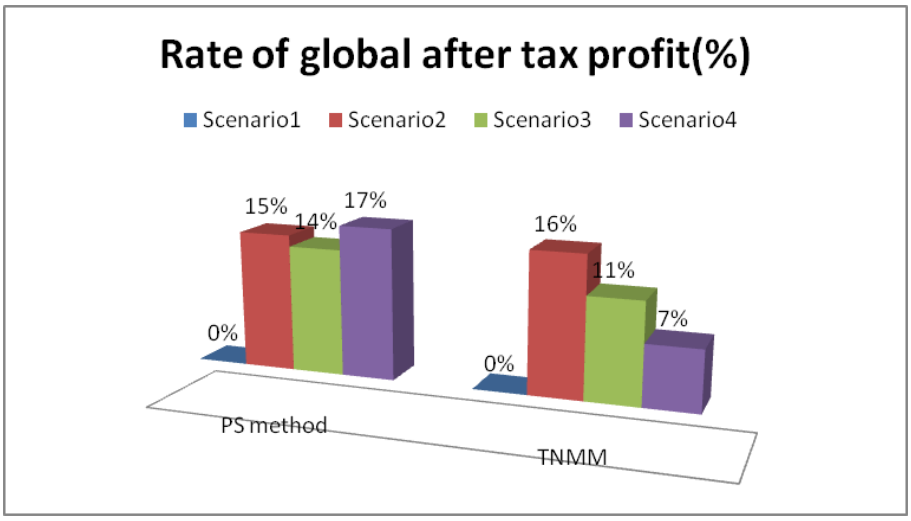

Figure 4. Comparison of Impact of Profit Split method vs TNMM on after tax global profit

Figure 5 demonstrates the instability that may occur in this case. If company adopts scenario 4 then its ATGP decreases from 17% to 7% which is a big gap that has many risks on company's activities and further strategies. For sure if company did not transfer any capacity as per scenario1, then the ATGP remains steady over the four years. Although, the ATGP fluctuates noticeably while increasing the amount of capacities transferred to site2. From here we can see the importance of a pre-agreement on transfer pricing method in order to ensure legal security and fiscal stability for relocated firms.

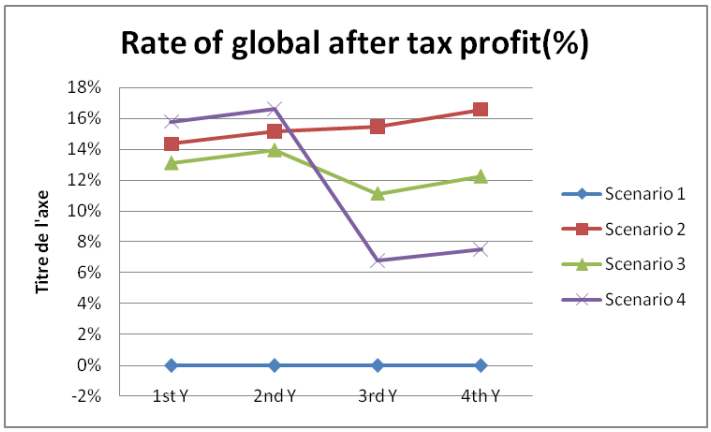

Figure 5. Impact of abscence of advanced price agreement on After tax global profit

Conclusion and perspectives

We conducted an overview analysis of the different dimensions and parameters that influence the optimization of supply chain models in the context of firms delocalization. We have shown the importance of transfer pricing as a decision variable in the capacities delocalization. BEPS project, on its part, has introduced new challenges in terms of transfer pricing. By analyzing results of a case study we measure the impact of using different price methodologies on the overall profit of the company as well as the decision of capacity transfer. Our model can be generalized to make decision for big instance of potential subsidiaries and decide the capacities to be installed in each of these new locations. We plan also to introduce the other OECD constraints and especially the ones related to risk and intangible cost allocation. It will be a tool to draw new conclusions useful for government and multinational firms.

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