Negotiated transfer pricing and uncertain regulation: a simulated trust game approach

Cascavilla, Alessandro

2023

Negotiated transfer pricing and uncertain regulation: a simulated trust game approach

Alessandro Cascavilla[I]
[I]Department of Law and Economics, University of Rome Unitelma Sapienza

Abstract

This study presents a novel approach to transfer pricing within multinational enterprises (MNEs), focusing on the strategic dynamics between two key divisions, the parent and subsidiary, operating in distinct countries that vary in corporate tax rates. Departing from traditional literature, we introduce a trust game framework to model the negotiation of transfer pricing among divisional managers. Our agent-based algorithm simulates an economy comprising multiple MNEs and a regulating State. The simulation outcomes shed light on the complex interplay of factors in this context. Without State intervention and managerial influence, MNEs tend to maximize their transfer pricing, strategically shifting profits to lower-tax jurisdictions. However, when we incorporate managerial negotiation, increasing transfer pricing leads to a decline in parent division profits but a surge in subsidiary division profits, ultimately increasing the overall MNE's profitability. The State's role emerges as pivotal, with the potential for random controls and penalties to nudge the game dynamics toward a cooperative equilibrium. This research offers valuable insights into the multifaceted world of international tax planning and coordination, underscoring the intricate balance between profit optimization and regulatory compliance in a globalized economy.

Keywords: Multinational enterprise, Corporate tax, Tax avoidance, Transfer pricing, Trust game, Negotiation, Foreign direct investment, Arm's length principle, Tax competition
JEL codes: F23; H21; H26; L51

1. Introduction and literature review

Globalization and advanced technologies have opened opportunities for businesses to expand their operations and supply chains across borders. This trend in international trade has the potential to increase overall economic welfare. However, it also presents challenges, particularly in the context of multinational enterprises (MNEs) and their tax planning strategies. MNEs, defined as companies with at least two facilities in different countries, are major players in international trade. Their international tax management practices often involve activities that manipulate taxes, resulting in negative consequences for both states and citizens. Among the primary goals of MNEs' international tax management is to enhance their corporation-wide profits by minimizing the total tax burden. This is achievable due to disparities in international corporate tax rates and the common practice of setting strategic transfer prices for intermediate goods traded within the same company. The aim for MNEs in this domain is to determine the optimal transfer price, one that encourages both division managers, who act in their self-interest and are rewarded based on divisional profits, to make decisions that benefit the firm. This practice has significant implications for the global economy, especially considering that the share of intermediate goods in total manufactured and consumed goods traded increased from 10% in 1925 to over 65% in 2005 (Hanson et al, 2005). Therefore, the pricing of these intermediate goods, particularly when traded within the same company, has a substantial impact on consumer and producer surplus in the global economy.

The absence of international coordination among countries presents a dual challenge. On one hand, it offers opportunities for strategic behavior by MNEs in setting transfer prices, leading to increased profits. On the other hand, it results in a loss of surplus for the state. In a world where capital can freely flow, states compete to attract capital by lowering their tax rates, essentially engaging in a race to the bottom. If more states were to agree on a common tax rate, other non-participating countries could benefit by offering even lower tax rates. This phenomenon explains why tax competition often outweighs tax cooperation, resulting in the existence of tax havens within the same economic region.

To address this international coordination problem, supranational organizations have made attempts at cooperation. The OECD, for instance, proposed guidelines on transfer pricing methods in 2010 (updated in 2017), introducing five common transfer pricing methods accepted by most tax authorities. These methods are divided into "traditional transaction methods," based on actual market transactions, and "transactional profit methods," relying on divisional profits.

Traditional methods include the Comparable Uncontrolled Price method (CUP), Resale Price Method, and Cost Plus Method. These methods determine transfer pricing based on real market prices under similar circumstances. In contrast, profit methods are more complex, requiring internal functional analysis of each firm's unique situation. With the increasing digitalization of the economy, the Profit Split Method (PSM) has gained popularity among MNEs. Due to its subjectivity, the allocation of profits among divisions using this method can be unfair or strategic, leading to risks of penalties or litigation. In the European context, the EU Joint Transfer Pricing Forum (2018) proposed a coordinated approach to transfer pricing controls. The aim is to "Think international – act international – audit international," enhancing the internal market's functioning by providing a transparent and efficient tool for national tax administrations to allocate taxing rights while preventing double taxation and double non-taxation.

The optimal transfer pricing concern has been extensively studied from an economic perspective. Hirshleifer (1956) introduced the first economic approach to transfer pricing, developing an optimization model to find the optimal transfer price for a firm with two divisions: manufacturing, and distribution. This model explored both exogenous and endogenous transfer pricing methods. Exogenous transfer pricing relies on market-based methods, where the multinational company sets transfer prices equal to the market price of the internally traded good. Endogenous transfer pricing, on the other hand, allows firms to set prices themselves, either in a centralized or decentralized manner. The choice between these approaches depends on market competitiveness and the existence of comparable markets. Horst (1971) supported the idea of exogenous transfer pricing, showing that MNEs would set transfer prices as high or low as possible based on government rules and tariff schedules for international trade. Kant (1987) extended this concept, considering the uncertain state intervention in endogenous transfer pricing models. Kant's model demonstrated how strategic transfer pricing resembles wage and price controls, with firms exploiting tax differentials between countries to manipulate transfer prices. While most of the research focused on centralized transfer pricing, a strand of literature emerged, advocating for endogenous and decentralized transfer pricing, reflecting real-world practices. Stoughton (1992) contributed by considering information asymmetry between a parent company and a partially owned foreign subsidiary, leading to a non-cooperative solution. Vaysman (1998) introduced a model of dynamic and negotiated transfer pricing for firms with headquarters and two divisions, emphasizing personal compensation schemes. Gox (2000) proposed a two-stage negotiated transfer pricing model with duopolistic price competition on the final market. This model accounted for asymmetric information and sequential decision-making. In the absence of real data, recent developments in this field have involved computational analyses through simulations. Transfer pricing literature has also explored the impact of vertical specialization, or foreign outsourcing, on supply chains. Rosenthal (2008) examined cooperative games in the context of different transfer pricing systems and supply chain modifications based on product valuations. Hammami and Frein (2014) mathematically demonstrated how supply chains can be redesigned in the global economy using transfer pricing methods, considering asymmetric information between firms and tax authorities. Simulation models, such as those by Lu Gao and Zhao (2015), have analyzed the relationship between corporate tax rates and transfer pricing systems, considering the effect on divisional revenues and costs. Yao (2013) explored the impact of introducing the Arm's Length Principle on overall firm profits, concluding that it may not increase tax revenue as expected by tax authorities. The game theoretic approach has proven effective in capturing the negotiation of transfer pricing. Non-cooperative equilibriums often arise and offer insights into how transfer pricing varies when divisional managers engage in strategic behavior. This paper aims to contribute to the existing literature on the economic aspects of transfer pricing. It builds upon the primary works in this field and presents a model focused on the profit split method of transfer pricing. In this model, various MNEs consisting of two divisions (Parent and foreign Subsidiary) located in different countries could shift profits abroad to lower-tax jurisdictions. However, they face the risk of penalties imposed randomly by the state. To capture the dynamics behind the negotiation of transfer pricing, the model employs the trust game, a sequential and non-cooperative game introduced by Berg et al. (1995). The game assumes that the foreign subsidiary can be partially owned by the parent company, and the exchange of equity shares serves as a proxy for the trust game.

2. The model

The baseline model is the following: there is a multinational company M that wants to increase profits shifting them to the lower-tax country, and two divisions carry out its supply chain: P=Parent (buying division, distribution division); S=Subsidiary (selling division, manufacturing division). The parent company operates in the domestic market, while the subsidiary is located in the foreign market. The value chain is split into two sequential activities: Subsidiary (S) buys raw materials at cost C, transforms and produces an intermediate good Qs that is sold to the parent P at the transfer pricing TR. Parent (P) buys the intermediate good from Subsidiary at TR and sells Qp in the final market at a given market price P. For the sake of simplicity, the model assumes that production costs are constant, firms are price takers, the quantity of intermediate good produced is the same of the final good (Qs=Qp), no transaction costs or tariffs exist and the exchange rate between P and S currencies is equal to 1.[1] The gross profits of the two divisions at time 0 are:

$$\pi_{m,0} = \pi_{p,0} + \pi_{s,0} = Q_p(P - TR) + Q_s(TR - C) \tag{1}$$

In order to get the net profits equation, suppose that different corporate tax rates exist between the parent's country and the subsidiary's. The tax rates are a percentage of gross profits and are

[1] These assumptions are consistent with the work of Kant (1987), Vaysman (1998) and Stoughton (1992).

represented by t_p for the parent and t_s for the subsidiary. Calling $TP = (1 - t_p)$ and $TS = (1 - t_s)$, we get the equation for the net MNE's profit:

$$\pi_{m,0} = \pi_{p,0}\, TP \; + \pi_{s,0}\, TS \qquad (2)$$

In contrast to Kant (1987), we suppose that the country where the Parent division operates shows a higher tax rate. In this part of the model, where we assume the centralized approach, the absence of managers' role, and the absence of the State intervention, the strategic decision of the headquarters is straightforward. In order to bear a lower of tax burden and to gain more profits, the centralized decision could be to show profits where tax rate is lower. In particular, in order to shift profits to the subsidiary accounting system, the headquarters will increase overall profits by moving upward the transfer price, by over-invoicing bills. An increase in TR would have several effects: a positive impact on overall unitary profits, equal to the difference between corporate tax rates $\frac{\partial \pi_{M,0}}{\partial TR_0} > 0$; a negative impact on parent's profit $\frac{\partial \pi_{p,0}}{\partial TR_0} < 0$; a positive and larger impact on the subsidiary's profit $\frac{\partial \pi_{s,0}}{\partial TR_0} > 0$. Even though these effects seem to be effective for a potential MNE's taxation strategy, some limits exist. In fact, with the centralized approach, the role of both division managers is null, while they play a key role in setting the transfer pricing level since they are usually rewarded according to the divisional profits (Vaysman 1998).

Then, we aim to eliminate the constraint of excluding managers from the process. The negotiated transfer pricing system is particularly suitable for multinational enterprises (MNEs) because it results from an agreement among managers, who are typically incentivized based on their division's profits. This incentivizes them to reach an optimal agreement, making it preferable to the centralized approach. Additionally, setting the optimal transfer pricing in line with tax authority guidelines can be time-consuming for the headquarters (HQ) in many cases. Therefore, a decentralized approach saves time and resources for the entire multinational. To capture the dynamics of bargaining between the two divisional managers, we employ the "trust game" proposed by Berg et al. (1995), also known as the "investment game." This sequential two-stage game involves two players: the investor and the trustee. The investor initiates the game and must decide whether or not to trust the trustee by giving them money. If the investor trusts the trustee, the trustee receives a multiple of that amount and can choose to reciprocate or not. If the trustee reciprocates, a portion of the money is returned to the investor; otherwise, the trustee keeps all the money. In our context, the trust game is structured as follows: first, the HQ gives managers P and S the authority to set transfer pricing. Then, the trust game unfolds between P (investor) and S (trustee). The sequence of moves is as follows: I) P decides whether to shift a portion of its profits to S by adjusting the transfer pricing. Simultaneously, P proposes a share of S's profits (equity shares); II)S automatically receives the designated portion of P's profits. Subsequently, S decides whether to reciprocate or not, based on their willingness to accept P's proposed share; III)If S reciprocates, a portion of S's profits is returned to P, concluding the game. If S does not reciprocate, no money is shifted back to the parent, and the game ends. This game is played repeatedly over time between managers, introducing two levels of asymmetric information. First, there is asymmetric information between the MNE's HQ and the two divisional managers. The model assumes that only the manager of the parent company possesses some information about the HQ's intentions. Second, there is asymmetric information between P and S. Specifically, P is unaware of S's production costs, potentially leading to a mismatch between the proposed participation in profits by S and the request by P. Parent knows that the HQ aims to increase the transfer pricing because of the condition TS > TP. Consequently, P initiates bargaining with the divisional manager of the selling (manufacturing) division, S. To commence the bargaining, P suggests shifting a portion of their profits to S through overpricing S's bills, which entails an increase in the intermediate product's price, i.e., the transfer pricing, as expressed by the following equation:

$$\gamma = \frac{(P - TR_1)}{(P - TR_0)} \qquad (3)$$

Where γ is the share of π_p that P would keep, shifting the portion $(1-\gamma)$ to S. As one can see, if TR_1 increases, γ decreases, thus P shows trustworthiness. The payoff of P at time 0 is the following:2

$$\pi_{p,0} = Q_p TP(P - TR_0) \tag{4}$$

After P trusts S, he gets the payoff at time 1:

$$\pi_{p,1,tr} = Q_p TP[\gamma(P - TR_0)] \tag{5}$$

This payoff function is consistent with the relationship $\frac{\partial \pi_p}{\partial TR}$<0 because if transfer pricing increases, then γ would decrease and π_p too. Then, P would ask a participation on S profits (ρ^P) at least equal to the share of profit just shifted, due to the increase of transfer pricing:

$$\rho^P \geq (1-\gamma) \tag{6}$$

In order to capture the behavioral strategy of parent manager, P will propose a participation ρ^P according to the previous rule, augmented by the possibility of gain, that is a term influenced by P beliefs. When P profits decrease, then he would like to ask for a lower participation ρ^P. On the contrary, if $\pi_{p,1} > \pi_{p,0}$, then P believes that he has much bargaining power, and would ask for a greater participation on S profits. This means that the participation ask by P on S profits is:

$$\rho^P \geq (1-\gamma)(1+\mathrm{Pr}) \tag{7}$$

Where:

$$Pr > 0 \qquad \text{if } \pi_{p,1} > \pi_{p,0}$$
$$Pr < 0 \qquad \text{If } \pi_{p,1} < \pi_{p,0}$$

If S accepts the participation proposed by P, S reciprocates, and P would get the following payoff:

$$\pi_{p,1,r} = Q_p TP[\gamma(P - TR_0)] + \rho^P \pi_{s,1,nr} \tag{8}$$

As already said, we assume a sort of asymmetric information between P and S, because only P knows that headquarter wants to increase profits just through an increase in TR, and P is not informed about the production cost of the intermediate good paid by S. The payoff of S at time t=0 would be:

$$\pi_{s,0} = Q_s TS(TR_0 - C) \tag{9}$$

In the second stage, S receives the proposal of P profits in the measure of (1-γ)$\pi_{p,0}$, and he has to decide whether reciprocate giving back the quantity $\rho(\pi_{s,1,nr})$ of its profits to P. Moreover, S unitary profits increase following this rule:

$$(TR_1 - C) = (TR_0 - C) + (1-\gamma)(P - TR_0) \tag{10}$$

The new unitary gross margin of S is given by the sum of the former one and the profit transferred from P. Hence, the payoff of S at time t=1 would be:

$$\pi_{s,1,nr} = Q_s TS(TR_1 - C) \tag{11}$$

At this point, S can decide whether to reciprocate accepting the participation of P on its profits (ρ^P) or just keep the profit shifted through the increase of transfer pricing. This decision depends on the size of ρ^P and on the one that S is willing to accept: ρ^s. However, S will accept only if $\pi_{s,1}$ is at least greater than $\pi_{s,0}$. The maximum willingness to reciprocate of S ($\rho^S\, max$) is:

$$\begin{gathered} \pi_{s,1} \geq \pi_{s,0} \\ Q_s\; TS\; (TR_1 - C)\,(1 - \rho^S) \geq Q_s\; TS\; (TR_0 - C) \\ \rho^S\, max \leq 1 - \frac{TR_0 - C}{TR_1 - C} \end{gathered} \tag{12}$$

Since ρ^s is a function of production costs C, and Parent does not know about the producing cost of S, P does not know the exact S willingness to accept the participation, and thus a mismatch between participation bid and ask could arise. Hence, S will reciprocate if $\rho^s \geq \rho^P$, not otherwise. If S reciprocates, his payoff would be:

$$\pi_{s,1,r} = Q_s TS[(P - C) - \gamma(P - TR_0)](1 - \rho^P) \tag{13}$$

---

2 Notation: $\pi_{i,t,g}$: profit of subject i, at time t, with strategy g;$i = M, P, S$: Multinational, Parent, Subsidiary; t=0,…,T; g= tr, nt, r, nr= trust, no trust, reciprocate, no reciprocate

We assume that N iid multinational firms compose the market, all with the same structure. Thus the market at time *t* is:

$$\text{Market} = \sum_{j=1}^{N} M_{j,t} \tag{14}$$

Where the index j identifies each of the N multinationals. On the other hand, a State controls each period the tax activity and the transfer pricing level of some MNEs present in the market. The state intervention is assumed to be exogenous. The State intervenes with some regulation in terms of transfer pricing standards, which are represented by a transfer pricing threshold that cannot be exceeded by each MNE, therefore a sort of maximum admitted transfer pricing exists. In fact, let us assume that the State wants to keep the transfer pricing equal to the Arm's Length Price (ALP)[3], that in the model is assumed to be the one given as endowment to all MNEs at time 0, hence $TR_{j,0}= TR*$. Then, if transfer pricing exceeds $TR*$, the parent company could be forced to pay a penalty F_t which could be imposed with a probability of being caught, α.The penalty is not certain any time the transfer pricing is exceeded, but this depends on how difficult and costly controlling activities are for the State. The penalty amount $F_{t,}$ is given by the following equation:

$$Fj_{,t} = \{\beta(TR_{j,t} - TR_{j,0})\} \qquad \text{with probability } \alpha$$
$$Fj_{,t} = 0 \qquad \text{with probability } (1-\alpha)$$

Where $\beta > 0;\ \alpha \in [0, 1]$.

It is important to specify that in our simulation the role of the State is exogenous. The tax authority's involvement is assumed to follow a linear function based on the difference between the current transfer pricing level and the initial one at time 0. This means that as the transfer pricing level increases, the severity of potential abuse and consequent penalties for MNEs, if caught, also increases. The factor β quantifies the state's severity in this regard, indicating that excessively inflated transfer pricing by MNEs carries a higher risk of incurring significant penalties when detected. Additionally, the probability α reflects the frequency with which the state conducts controls on MNEs each year. There exists a form of asymmetric information between tax authorities (the state) and multinational companies. Specifically, the multinational's headquarters (HQ) is aware only of whether the state enforces tax regulations but remains unaware of the exact probability. In simpler terms, when the state does not exert control (i.e., in a tax haven scenario), the HQ adopts a centralized transfer pricing approach. Conversely, if the state implements random controls with α > 0, the HQ decentralizes decision-making, allowing divisional managers to negotiate the optimal transfer pricing level, as outlined in the previous section. However, MNEs never set a transfer pricing exceeding an upper limit, $\overline{TR}$ to prevent Parent division's profits from turning negative. Furthermore, the state incurs costs for conducting these controls on MNEs in terms of time and resources. We assume that controls are made in the domestic market, so where P is located, and thus P is supposed to cover the cost of the potential penalty. Another important assumption on the transfer pricing dynamic has to be made. Recalling the asymmetric information between managers and headquarter, where only P knows about the headquarter strategy, we can assume that the transfer pricing increases when the multinational has not been caught. This means that each $M_{j,t}$tries to shift profits abroad but will increase the transfer pricing only in case the State had not fine it in the past period. Otherwise, the transfer pricing decreases and goes back to the initial level (Arm's Length Price). In general, this can be summarized as follows:

$$TR_{j,t} = TR_{j,t-1} + 1 \qquad \text{if } F_{j,t-1} = 0$$
$$TR_{j,t} = TR_{j,0} \qquad \text{if } F_{j,t-1} > 0$$

[3] OECD, (2017) *Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations.*

We assumed that only the Head Quarter (HQ) knows whether or not the state is a tax heaven ($\alpha = 0$) or whether there are some controls ($\alpha > 0$). In the first case, HQ would opt for the centralized system, increasing the transfer pricing as high as possible. On the other, for the sake of efficiency, the transfer pricing system is decentralized, and the bargaining game starts between the Parent and Subsidiary. The sequence of the events that we simulated in the algorithm, according to the final payoff tree scheme (See appendix A).

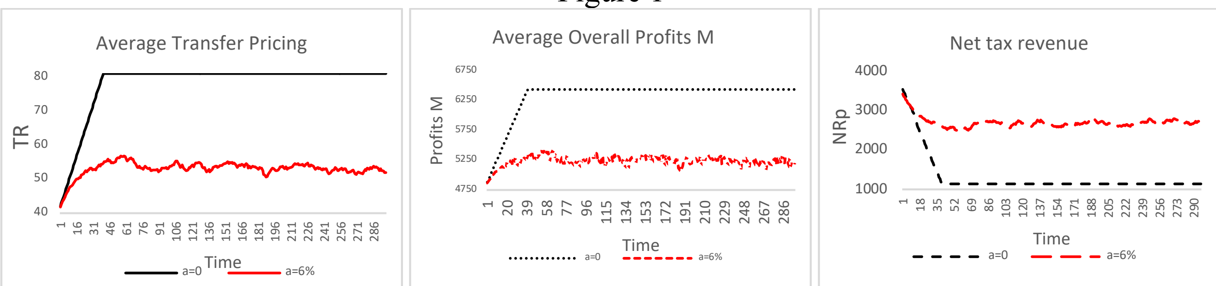
3. Simulations results

We simulate the initial model and the equilibrium of the centralized approach, setting the transfer pricing varying in the interval [40$, 80$]. Then, we simulate the model with negotiated transfer pricing and state intervention. The simulation is made on $N = 50$ MNEs (50 P and 50 S) over $t = 300$ periods. The market starts according to the following endowments: $Qp = Qs = 100$; $P = 100\$$; $C = 10\$$; $r = 0{,}2$; $TR_0 = 40\$$; $\alpha = 0$; $Pr = 30\%$; $\varepsilon_t = 1$; $\theta = 2000$. We propose four treatments for six level of state intervention, $\alpha = 0; 6\%; 10\%; 20\%; 50\%; 100\%$. We propose four treatments:

1) High tax rate and low penalty: (tp=60%; β=100)
2) High tax rate and high penalty: (tp=60%; β=200)
3) Low tax rate and low penalty: (tp=40%; β=100)
4) Low tax rate and high penalty: (tp=40%; β=200)

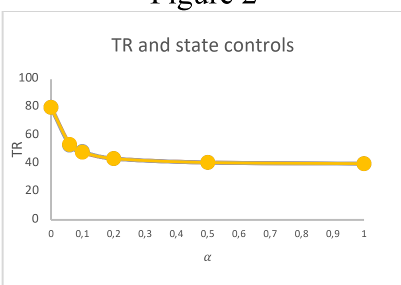
The following graphs represent the time series of key variables in the centralized approach (α=0) and in the decentralized system with the state intervention at 6% (α=6%), with tp=40 and β=100.

Figure 1



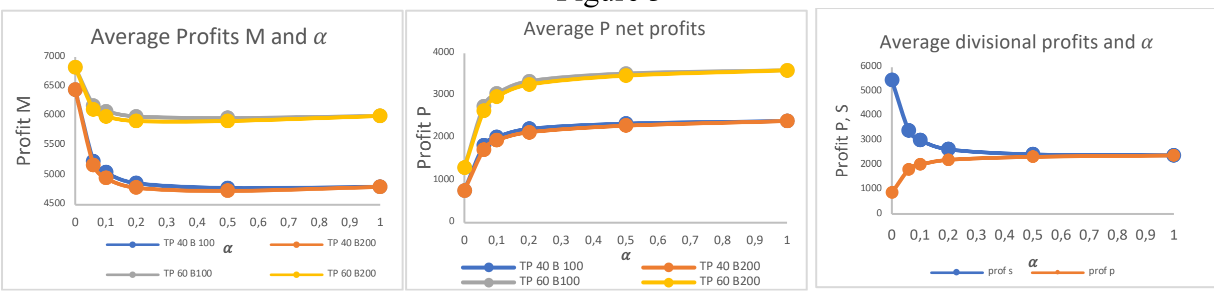
An increase in α leads to a decrease in the average transfer pricing level. When α is held constant, the differences across various treatments appear negligible. Initially, at α=0, the transfer pricing reaches $80, representing the maximum allowable level to avoid certain penalties, hence MNEs exploit this maximum potential profit. However, when the State intervenes at α=6%, the average TR drops to an average of $53.6, accompanied by an increase in the standard error. When the State controls the entire market, TR aligns with the Arm's Length Price (ALP) at $40. The relationship between TR and α is decreasing, despite the theoretical assumption of a linear relationship between TR and α. While the empirical results differ slightly, the linear relationship effectively captures the negative correlation between TR and α.

Figure 2



The reduction in Transfer Pricing (TR) as α increases has a dual effect. On one hand, overall MNE profits decrease because capital is redirected and taxed in the parent division (P), where the tax rate is higher. On the other hand, capital flows back to P, leading to an increase in P's profits. Simulated data corroborate these outcomes. In the presented table depicting the average profits of representative MNEs across different treatments, a clear correlation between overall profits and State controls emerges. Across all treatments, heightened State controls consistently result in decreased overall profits, aligning with the theoretical model. However, this trend holds true only until α≤50. For instance, in the High Tax Rate treatment, MNE profits drop from an initial level of $6440 to $4781 and $4731, while in the Low Tax Rate treatment, P's profits decrease from $6820 to $5965.4 and $5915 as α increases to 100%. An increase in transfer pricing typically aims to boost overall profits, given the assumption of a lower corporate tax rate in the subsidiary (S) country. However, when α=50%, the average TR level aligns closely with the Arm's Length Price (ALP), stifling further growth. Firms seeking to increase transfer pricing in this context face a dilemma: the potential gains from transfer pricing are outweighed by the State's 50% probability of imposing penalties. Consequently, MNE profits stabilize when the State controls all firms, as the penalty effect supersedes the transfer effect.

Figure 3



The graphical representation of the table also illustrates that reducing P's tax rate from 60% to 40% shifts the profit curves upward. When the penalty factor β doubles from 100 to 200, MNE profit curves (yellow and orange) consistently fall below those with the lower penalty (blue and grey), except in cases of α=0% or α=100%. There may be concerns that as the state imposes penalties on P, its profits would inversely correlate with an increase in α. In reality, this is not the case. As α increases, TR decreases, leading to a smaller M and subsequently increasing P's unitary gross margin. However, this trend holds only until α=50%. Across all treatments, the relationship between P's profits and α is positive. The connection between P's profits and state control follows a positive and concave function. A decrease in corporate tax rate results in increased P profits. Additionally, higher penalties reduce P profits in both low and high tax rate treatments. Graphically, this pattern holds true for both tax rate scenarios, with a lower tax rate shifting the P profits line upwards. If the relationship between state regulation and profits is positive for P, this is the opposite for S. In fact, an increase in transfer pricing regulation would like to bring back foreign capital, decreasing S profits. This effect is visible in the following graph, showing the relationship between state regulation, the profit of Parent and Subsidiary. As one can see, when the State does not regulate, the transfer pricing is maximized, and profit M too. When the P state intensifies the regulation, then the profits of the two divisions start to be closer and closer, until α=100%, and the transfer pricing is equal to the minimum (ALP).

Table 1

	Transfer pricing variation		**Profit P variation**		**Profit S variation**	
	β=100	**β =200**	**β =100**	**β =200**	**β =100**	**β =200**
$\Delta_{\alpha=20\%,\ \alpha=100\%}$	0.089***	0.09***	-0.077***	-0.111***	0.103***	0.105***
$\Delta_{\alpha=10\%,\ \alpha=100\%}$	0.211***	0.208***	-0.154***	-0.176***	0.264***	0.26***

Variations are computed with respect to the baseline scenario. ***Represents p-value<0.01.

Concluding remarks and discussion

This research aimed to make a valuable contribution to the economic understanding of transfer pricing through an agent-based approach, simulating an economy involving multiple Multinational Enterprises (MNEs) and a single State. The initial focus was on developing a theoretical model, which first examined the centralized transfer pricing mechanism. The key finding was that, in the absence of State regulation and managerial involvement, MNEs would exploit the potential for profit by maximizing transfer pricing, enabling them to declare profits in lower-tax jurisdictions. However, this conclusion hinged on the strong assumptions of no State intervention and the absence of managerial roles. When managerial negotiation was introduced, different scenarios emerged. Increasing transfer pricing resulted in a decrease in the parent division's profits but an increase in the subsidiary division's profits, ultimately boosting the overall MNE's profits. The role of the State was crucial, as random controls and penalties transformed the game dynamics into a cooperative setting. In such cases, a negotiated transfer pricing system proved more suitable. Future research should focus on investigating the optimal state intervention to minimize opportunistic MNEs' behavior, as well as exploring strategies for domestic parent divisions to transfer the negative effects of increased transfer pricing onto final customers by adjusting final prices, accounting for price elasticity of demand, and considering the nature of the final goods in various markets. Experimental evidence through laboratory experiments, similar to Thran et al. (2016), could provide insights into managers' decision-making and validate different model parameterizations.

References

Berg, J., (1995) “*Trust, Reciprocity, and Social History*”, Games and Economic Behavior, Volume 10, Issue 1.

Eden, L,. (1985) “*The Microeconomics of Transfer Pricing*”, St. Martins Press, 1985. pp. 13-46.

Forsythe, R, Horowitz, J., Savin, N.E., Sefton M., (1994) “*Fairness in Simple Bargaining Experiments*”, Games and Economic Behavior, Volume 6, Issue 3, Pages 347-369.

Gao, L., (2015) “*Determining Intra-company Transfer Pricing for Multinational Corporations*”, International Journal of Production Economics.

Gox, R., (2000) “*Strategic transfer pricing, absorption costing, and observability*”, Management Accounting Research, Vol. 11, Issue 3, pp 327-348.

Guth, W., Schmitteberger, R., Schwarze, B., (1982) “*An experimental analysis of ultimatum bargaining*”, Journal of Economic Behavior & Organization,Volume 3, Issue 4, Pages 367-388.

Hammami, R., (2014) “*Redesign of global supply chains with integration of transfer pricing: Mathematical modeling and managerial insights*”, International Journal of Production Economics, vol. 158, issue C, 267-277.

Hanson G.H., Mataloni R. J., Slaughter M.J., (2005) "*Vertical Production Networks in Multinational Firms*" The Review of Economics and Statistics, MIT Press, vol. 87(4), pages 664-678.

Hirshleifer. J, (1956) “*On The Economics of Transfer Pricing*”, Journal of Business: 172-184.

Horst, T. (1971) “*The Theory of the Multinational Firm: Optimal Behavior under Different Tariff and Tax Rates*”, Journal of Political Economy: 1059-1072.

Kant, C., (1998) “*Endogenous Transfer Pricing and The Effects of Uncertain Regulation*”, Journal of International Economics: 147-157.

Rosenthal, E. C., (2008) “*A game-theoretic approach to transfer pricing in a vertically integrated supply chain*”, International Journal of Production Economics, Elsevier, vol. 115(2), pages 542-552.

Stoughton, N., (1994) “*A mechanism design approach to transfer pricing by the multinational firm*”, European Economic Review, 143-l 70. North-Holland.

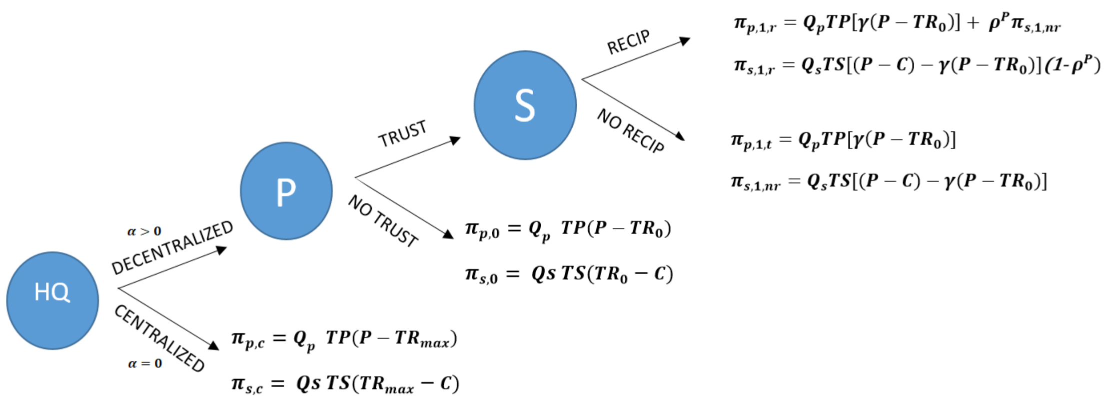
Tran, Q.H., Croson R., Seldon B.J., (2016) “*Experimental Evidence on Transfer Pricing*”, International Journal of Management and Economics No. 50, pp. 27–48.

Vaysman, I., (1998) “*A model of negotiated transfer pricing*”, Journal of Accounting and Economics, 1998, vol. 25, issue 3, 349-384.

Yao, J., (2013) “*The arm’s length principle, transfer pricing, and location choices*”, Journal of Economics and Business, PP 1–13, 2013.

Appendix A

Payoff tree



Model simulation