

**CORPORATE TAX COMPETITION AND PROFIT SHIFTING  
IN ASYMMETRIC SIZE ECONOMIES:  
EXPLORING MULTINATIONAL FIRMS' STRATEGIES AND  
GOVERNMENT RESPONSES**

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## ABSTRACT

In today's globalised economy, Multinational National Enterprises (MNEs) wield significant influence over the economic landscape. The strategic decision of where MNEs locate is a crucial strategic decision, shaped by factors such as market size, tax policies, transfer pricing regulations, and the potential for profit shifting. This dissertation embarks on a comprehensive exploration of this complex landscape and the aim is to provide a nuanced understanding of how asymmetrically sized economies strategically devise fiscal and regulatory policies to attract MNEs.

Employing an applied theoretical model, the study examines three distinct scenarios, representing diverse economic contexts. For each scenario, the model systematically determines the optimal location for a profit maximising MNE. This approach yields comprehensive insights into MNEs' strategic decision-making in the face of diverse regulatory landscapes, illuminating how changes in enforcement levels influence their location choices and profit-shifting tactics. Numerical simulations are conducted to validate and strengthen the theoretical framework, demonstrating its effectiveness in capturing real-world scenarios.

The model yields compelling insights, particularly highlighting the pivotal role of small countries. The model shows that in the absence of profit shifting opportunities, the MNE will exhibit a consistent preference to set up its plant in the large country. However, the model demonstrates that in a situation where profit shifting opportunities exist, by offering favourable tax rates and a more lenient enforcement regime, the small country can offset and outweigh the advantages of a larger market. This finding challenges conventional assumptions about the inherent advantages of larger markets, emphasising that with the right policies in place, small countries can be formidable players in the global economic landscape.

As the research culminates, it is evident that profit shifting and tax competition remain crucial subjects within the domain of international economics. These findings underscore the need for continued exploration and policy refinement to navigate the complexities of the global economic landscape effectively.

Keywords: Profit Shifting, Tax Competition, Enforcement, Small countries  
JEL Codes: F23, F38, H25, H26, H87

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# TABLE OF CONTENTS

<b>ABSTRACT</b> .....	<b>2</b>
<b>ACKNOWLEDGEMENTS</b> .....	<b>3</b>
<b>LIST OF FIGURES</b> .....	<b>6</b>
<b>LIST OF TABLES</b> .....	<b>6</b>
<b>LIST OF EQUATIONS</b> .....	<b>7</b>
<b>LIST OF ABBREVIATIONS</b> .....	<b>8</b>
<b>1. INTRODUCTION</b> .....	<b>9</b>
1.1 BACKGROUND.....	10
1.2 RESEARCH QUESTION.....	11
1.3 RESEARCH FOCUS .....	11
<b>2. CONTEXT</b> .....	<b>13</b>
2.1 INTRODUCTION.....	14
2.2 TRENDS IN CORPORATE TAX RATES .....	14
2.3 TIMEFRAME OF REGULATIONS .....	16
<b>3. LITERATURE REVIEW</b> .....	<b>19</b>
3.1 INTRODUCTION.....	20
3.2 THE ROLE OF CORPORATE TAX IN THE ECONOMY .....	20
3.2.1 <i>Tax Rate Determination by Governments and Influences</i> .....	20
3.2.2 <i>Corporate Tax Incentives and Corporate Tax Competition</i> .....	22
3.2.3 <i>Advantages and Disadvantages of Corporate Tax Competition</i> .....	23
3.3 TAX AVOIDANCE STRATEGIES.....	25
3.3.1 <i>Challenges in International Corporate Taxation</i> .....	25
3.3.2 <i>Channels of Profit Shifting</i> .....	26
3.3.3 <i>Enforcement &amp; Regulations</i> .....	26
3.4 SMALL STATES AND ASYMMETRIC TAX COMPETITION .....	28
3.4.1 <i>Economic Characteristics of SIDS</i> .....	28
3.4.2 <i>Small States and FDI</i> .....	28
3.4.3 <i>Asymmetric Tax Competition</i> .....	29
3.5 SYNTHESIS AND IDENTIFIED RESEARCH GAPS.....	31

<b>4. METHODOLOGY .....</b>	<b>32</b>
4.1 INTRODUCTION.....	33
4.2 WHAT IS AN APPLIED THEORETICAL MODEL .....	33
4.3 JUSTIFICATION OF METHOD.....	34
4.4 STRENGTHS AND WEAKNESSES.....	35
4.5 COMPONENTS OF THE GAME .....	36
4.5.1 <i>Players</i> .....	36
4.5.2 <i>Actions</i> .....	37
4.5.3 <i>Timing</i> .....	37
<b>5. THE MODEL.....</b>	<b>38</b>
5.1 INTRODUCTION.....	39
5.2 FRAMEWORK.....	39
5.3 THE GAME .....	42
5.4 INSIGHTS DERIVED FROM THE GAME .....	53
<b>6. DISCUSSION .....</b>	<b>54</b>
6.1 INTRODUCTION.....	55
6.2 SIMULATIONS.....	55
6.2.1 <i>Scenario 1</i> .....	55
6.2.2 <i>Scenario 2</i> .....	57
6.2.3 <i>Scenario 3</i> .....	61
6.3 DISCUSSION OF RESULTS.....	64
6.4 MODEL LIMITATIONS.....	65
<b>7. CONCLUSION .....</b>	<b>67</b>
7.1 INTRODUCTION.....	68
7.2 POLICY RELEVANCE & IMPLICATIONS .....	68
7.3 AVENUES FOR FURTHER RESEARCH .....	69
7.4 CONCLUDING REMARKS.....	70
<b>8. BIBLIOGRAPHY .....</b>	<b>71</b>
<b>9. APPENDIX.....</b>	<b>77</b>
9.1 APPENDIX A – FULL WORKINGS.....	78
9.2 APPENDIX B – PROOFS .....	87

## LIST OF FIGURES

Figure 1 - OECD Statutory Corporate Tax Rates for 2022 - OECD Tax Database.....	15
Figure 2 - OECD Average Statutory Corporate Tax Rate for 2001-2022 - OECD Tax Database .....	15
Figure 3 - Timeline of Regulations .....	16
Figure 4 - Set-Up of Model.....	40
Figure 5 - Transfer Pricing Set-Up .....	41
Figure 6 - Scenarios Considered .....	48
Figure 7 - Scenario 1 - No PS Opportunities .....	56
Figure 8 - Scenario 2 Case A - PS Opportunities exist but are equal .....	57
Figure 9 - Scenario 2 Case B - PS Opportunities exist but are equal .....	58
Figure 10 - Scenario 2 Case C - PS Opportunities exist but are equal .....	59
Figure 11 - Scenario 3 Case A - PS Opportunities exist but are unequal .....	61
Figure 12 - Scenario 3 Case B - PS Opportunities exist but are unequal .....	62
Figure 13 - Scenario 3 Case C - PS Opportunities exist but are unequal .....	63

## LIST OF TABLES

Table 1 - Scenario 1 - No PS Opportunities .....	56
Table 2 - Scenario 2 Case A - PS Opportunities exist but are equal .....	57
Table 3 - Scenario 2 Case B - PS Opportunities exist but are equal.....	58
Table 4 - Scenario 2 Case C - PS Opportunities exist but are equal.....	60
Table 5 - Scenario 3 Case A - PS Opportunities exist but are unequal .....	61
Table 6 - Scenario 3 Case B - PS Opportunities exist but are unequal.....	62
Table 7 - Scenario 3 Case C - PS Opportunities exist but are unequal.....	63

## LIST OF EQUATIONS

Equation Number	Equation
Equation (a.1)	$P_A = 1 - Q_A$
Equation (b.1)	$P_B = 1 - \frac{1}{N} Q_B$
Equation (a.2)	$\pi_A^* = (1 - t_A) \left[ (1 - Q_A^A) Q_A^A + \left( 1 - \frac{1}{N} Q_B^A - \tau \right) Q_B^A \right] + (\delta_A)(t_A - t_H)[Q_A^A + Q_B^A] - \frac{1}{2} \gamma_A \delta_A^2 - F$
Equation (b.2)	$\pi_B^* = (1 - t_B) \left[ (1 - Q_A^B - \tau) Q_A^B + \left( 1 - \frac{1}{N} Q_B^B \right) Q_B^B \right] + (\delta_B)(t_B - t_H)[Q_A^B + Q_B^B] - \frac{1}{2} \gamma_B \delta_B^2 - F$
Equation (a.3)	$\frac{(1 - t_A) + \delta_A(t_A - t_H)}{2(1 - t_A)} = Q_A^A$
Equation (a.4)	$\frac{N[(1 - t_A)(1 - \tau) + \delta_A(t_A - t_H)]}{2(1 - t_A)} = Q_B^A$
Equation (a.5)	$\frac{(t_A - t_H)(Q_A^A + Q_B^A)}{\gamma_A} = \delta_A$
Equation (b.3)	$\frac{(1 - t_B) - \tau(1 - t_B) + \delta_B(t_B - t_H)}{2(1 - t_B)} = Q_A^B$
Equation (b.4)	$\frac{N[(1 - t_B) + \delta_B(t_B - t_H)]}{2(1 - t_B)} = Q_B^B$
Equation (b.5)	$\frac{(t_B - t_H)(Q_A^B + Q_B^B)}{\gamma_B} = \delta_B$
Equation (a.6)	$\delta_A = \frac{(1 - t_A)(t_A - t_H)(1 + N(1 - \tau))}{2\gamma_A(1 - t_A) - (N + 1)(t_A - t_H)^2}$
Equation (b.6)	$\delta_B = \frac{(1 - t_B)(t_B - t_H)(N + 1 - \tau)}{2\gamma_B(1 - t_B) - (N + 1)(t_B - t_H)^2}$
Equation (a.7)	$\pi_A^* = \frac{(1 - t_A)}{4} \left[ 1 + N(1 - \tau)^2 + \frac{(t_A - t_H)^2(1 + N(1 - \tau))^2}{2\gamma_A(1 - t_A) - (N + 1)(t_A - t_H)^2} \right]$
Equation (b.7)	$\pi_B^* = \frac{(1 - t_B)}{4} \left[ N + (1 - \tau)^2 + \frac{(t_B - t_H)^2(N + 1 - \tau)^2}{2\gamma_B(1 - t_B) - (N + 1)(t_B - t_H)^2} \right]$

## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Definition</b>
ATAD	Anti-Tax Avoidance Directive
BEPS	Base Erosion and Profit Shifting
CCCTB	Common Consolidated Corporate Tax Base
CIT	Corporate Income Tax
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GloBE Rules	Global Anti-Base Erosion Rules
MNCs	Multinational Corporations
MNE	Multinational Enterprises
OECD	Organisation for Economic Cooperation and Development
UN	United Nations
US	United States

## **1. INTRODUCTION**

## **1.1 BACKGROUND**

In an era characterised by an increasingly globalised economy, the activities of Multinational Enterprises (MNEs) have assumed a paramount role in shaping the economic landscape of countries. Central to their operations is the strategic decision of where to locate their activities, a choice profoundly influenced by the size of the market, taxation policies, transfer pricing regulations, and the potential for profit shifting. In this context, the competition among countries to attract MNE investments through favourable tax regimes and relaxed transfer pricing enforcement mechanisms has emerged as a critical dimension of international economic relations.

As MNEs, with their vast operations spanning multiple countries, wield substantial influence over global economic flows, understanding their location preference is crucial. This dissertation embarks on a comprehensive exploration of this multifaceted landscape, seeking to unravel the intricate interplay between profit shifting, taxation competition, and transfer pricing cost reduction in the context of asymmetrically sized economies. Research in this area is essential to provide policymakers and stakeholders with valuable insights into how countries can effectively compete for Foreign Direct Investment (FDI) while maintaining a fair and sustainable economic environment.

The study makes a clear distinction between asymmetrically sized economies which refer to countries that significantly differ in terms of their size, in this case geographic and population size. In this context, symmetry leads to disparities in resources, market opportunities and economic influence. Thus my study also holds particular significance for smaller countries. In a globalised economy, small countries tend to face unique challenges in attracting FDI. This research illuminates strategies that can be especially advantageous for small countries, allowing them to position themselves effectively in the global economic landscape.

As regulatory changes loom on the horizon, small states find themselves at a pivotal juncture. This dissertation and its subsequent findings offer timely insights that can guide governments and policymakers in reshaping their economic policies, ensuring they remain economically competitive. This underscores the critical role my study plays in informing policy decisions that can have a profound impact on the economic prosperity and stability of smaller countries.

## 1.2 RESEARCH QUESTION

The central research question guiding this dissertation is as follows: **"What is the role of country-size asymmetry in determining the investment location of MNEs? How can Governments adjust national taxation and transfer pricing policies to attract and retain MNEs?"** Through this research question, the study endeavours to assess the strategic actions taken by countries of varying sizes in the context of their taxation policies and transfer pricing enforcement. By examining this intricate interplay between strategic policy adjustments, I aspire to shed light on the complexities of global economic competition and the strategies employed by governments to secure their positions in this dynamic landscape.

## 1.3 RESEARCH FOCUS

The primary objective of this research is to provide a nuanced understanding of how asymmetrically sized economies employ strategies related to profit shifting facilitation, tax competition, and reduced transfer pricing enforcement to attract an MNE from locating in their country. The Literature Review chapter aims to unravel and provide insights on the motivations behind these strategies, explore the mechanisms by which they are implemented, and assess the broader consequences within the context of the global economy. Moreover, this study acknowledges the unique dynamics and considerations inherent in countries of varying sizes, shedding light on the distinctive challenges and opportunities they encounter in this competitive landscape.

As my main methodology, I develop an applied theoretical model which describes a situation where two countries of asymmetric size compete for the location of the MNE's subsidiary. Diverging from the already existing literature, this study introduces the opportunity to shift profits from the parent company to the subsidiary whilst also incorporating an enforcement component, which increases the cost of profit shifting. With the inclusion of these new elements, the small country is now in a position to leverage the profit shifting mechanism to counteract the home market advantage held by the larger country.

After setting up the framework, the model considers three scenarios and seeks to predict how the MNE would react to different economic environments. The model is designed to simulate

and predict MNE location decisions in each scenario, offering valuable insights into the factors influencing their choices. These scenarios encompass a spectrum of taxation policies, transfer pricing regulations, and economic conditions, providing a comprehensive view of the potential outcomes and implications of various strategies employed by countries.

Hence the research aim is to elucidate the motivations, mechanisms, and consequences of these strategies within the global economic framework, while also recognising the distinct challenges and opportunities faced by countries of varying sizes. By delving into this complex realm, this study aspires to contribute valuable insights that can inform policymakers, facilitating a more informed and balanced discourse on the implications of these practices.

## **2. CONTEXT**

## **2.1 INTRODUCTION**

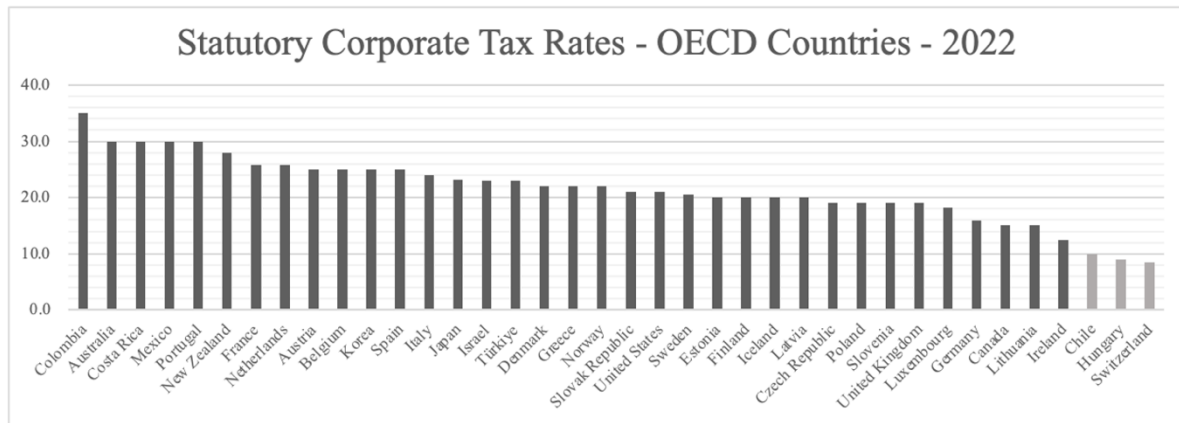
The context chapter plays a pivotal role in framing the study by providing a comprehensive overview of corporate tax rates and profit shifting trends and a timeline of regulations aimed at combating harmful tax competition. Through an in-depth analysis of the key and most prominent regulations such as the Common Consolidated Corporate Tax Base (CCCTB), the Action Plan to address Base Erosion and Profit Shifting (BEPS) and Global Anti-Base Erosion (GloBE) Rules, this chapter offers critical insights into the evolving landscape of international efforts to combat harmful tax competition and aggressive profit shifting. By contextualising these regulatory measures and trends, the chapter provides the background against which the model is designed. This foundation is instrumental in understanding the intricacies of MNE strategies and location decisions within this complex regulatory environment.

## **2.2 TRENDS IN CORPORATE TAX RATES**

In the last few decades, European countries have implemented a series of tax reforms aimed at reducing Corporate Income Tax (CIT) rates, leading to a noticeable decline in statutory tax rates. The distribution of CIT rates changed significantly between 2000 and 2022. In 2000, thirteen jurisdictions imposed tax rates of 40% or higher, whereas by 2022, no jurisdiction maintained tax rates at or above this threshold. Excluding zero-rate jurisdictions, the overall average statutory rate declined from 30.2% in 2000 to 21.3% in 2022 (OECD, 2022). Looking at individual countries alone, the downward trend is even more noticeable. In the early 1980s, companies in Sweden were taxed a 66% statutory tax rate. Following that, the rate was reduced to 30% in 1991 and in 2022 this was subsequently reduced to 20.6%. Large European countries like Germany exhibit a comparable pattern, albeit with a more prolonged period of adjustment (Deloitte, 2022).

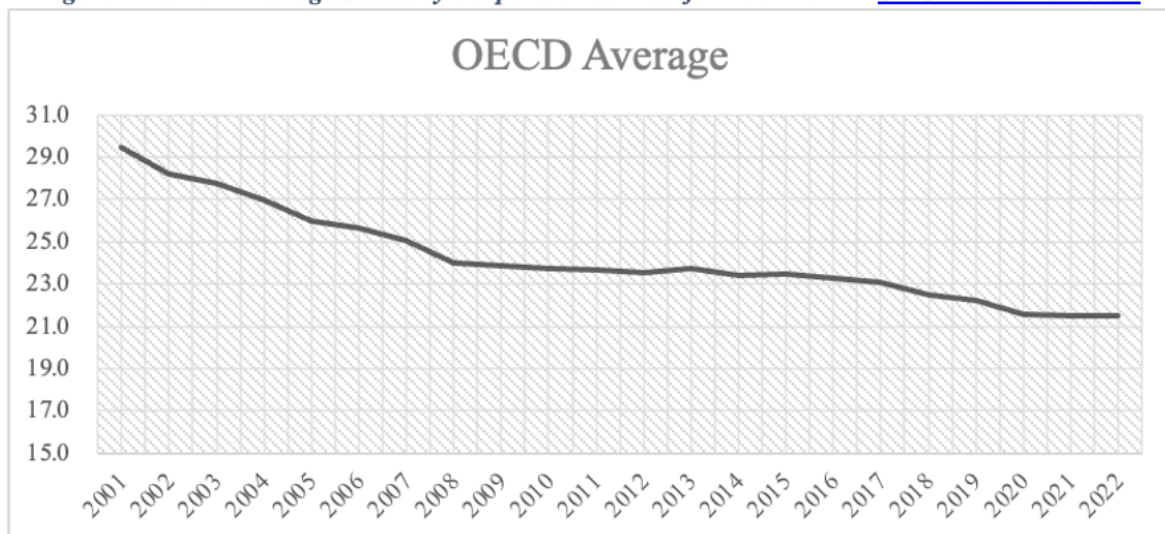
Figure 1 presents the statutory corporate tax rates for Organisation for Economic Cooperation and Development (OECD) countries in 2022. As can be observed, Switzerland, Hungary, and Chile are the three countries with the lowest corporate tax rates, standing at 8%, 9%, and 10%, respectively (OECD.Stat, 2022).

**Figure 1 - OECD Statutory Corporate Tax Rates for 2022 - [OECD Tax Database](#)**



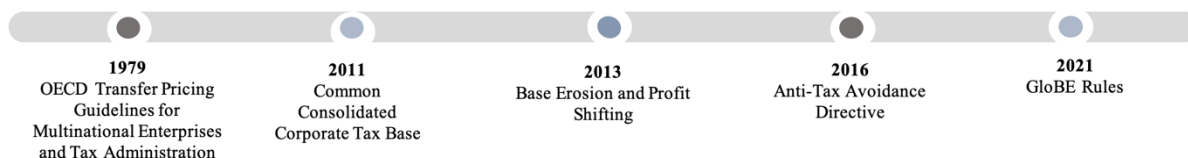
Meanwhile, Figure 2 provides a visual representation of the average statutory corporate tax rates within the OECD member countries spanning the period from 2001 to 2022. As can be observed, there is a declining trend over the years (OECD.Stat, 2022). The decline in corporate tax rates has been closely linked to an increase in profit shifting strategies employed by MNEs. As tax rates decrease, companies find it more appealing to shift profits to low-tax jurisdictions in order to minimise their overall tax liability. According to OECD research, in 2015 the cost of MNE’s tax avoidance was estimated to be between €93.9 to €225.4 billion equivalent to 4-10% of worldwide CIT revenues. Apart from substantial financial losses, BEPS lead to other detrimental economic consequences, including favouring MNEs employing aggressive tax strategies, intensifying the corporate debt bias, skewing the placement of highly mobile intangible assets, and misdirecting FDI (OECD, 2015).

**Figure 2 - OECD Average Statutory Corporate Tax Rate for 2001-2022 - [OECD Tax Database](#)**



## 2.3 TIMEFRAME OF REGULATIONS

*Figure 3 - Timeline of Regulations*



Perhaps the first attempt at controlling profit shifting can date back to the OECD's Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations in 1995. The Guidelines offer direction on how to use the "arm's length principle", which is the accepted international standard for valuing cross-border transactions between affiliated firms for tax reasons, i.e., transfer pricing. Initially published in 1979, the Guidelines received approval from the OECD Council in their original form in 1995. They were then revised and updated in 2009 and were substantially revised again in 2010 (OECD, 2010).

The European Commission introduced the CCCTB in 2011. The CCCTB is a single set of common rules used across all European Union (EU) member states to determine taxable profits, replacing the current system of national tax laws that can vary significantly between countries. Under the proposal, a company's taxable profits would be calculated based on a formula which takes into account the company's consolidated revenue, employment, and assets across all EU member states in which it operates. By adopting the CCCTB, discrepancies among individual country tax systems, special tax arrangements, and hidden tax rulings that tax evaders take advantage of are eradicated. Consequently, this removes the motivation for participating in transfer pricing schemes. The CCCTB incorporates strong anti-abuse provisions aimed at safeguarding Member States from the erosion of their tax base and the shifting of profits to countries outside the EU.

Since the announcement, the proposal has been subject to extensive debate and opposition particularly those with lower corporate tax rates that fear the loss of tax revenue under a harmonised system. Given the strong resistance, the Commission decided to relaunch the CCCTB in 2016 through a more manageable and tangible process (Commission, 2016). To date, the CCCTB has not yet been implemented.

The Action Plan on BEPS, initiated by the OECD in 2013, represents a landmark global effort to combat tax avoidance strategies employed by MNEs. The initiative seeks to tackle the erosion of tax bases and the transfer of profits to regions with lower tax rates, which can result in significant revenue losses for governments. The project brought together OECD and G20 countries to collaborate on the development of fifteen action points to tackle BEPS challenges comprehensively. These actions cover areas such as transfer pricing, digital taxation, harmful tax practices, and dispute resolution. The project has since led to the implementation of numerous international tax reforms and the strengthening of tax rules, marking a significant milestone in the fight against aggressive tax planning strategies by MNEs (OECD, 2013).

Adopted at EU level in 2016, the Anti-Tax Avoidance Directive (ATAD) was introduced as a response to the public concern over aggressive tax planning and harmful tax competition among member states. The directive proposes five legally binding anti-abuse measures including the Controlled-foreign Company rule and the Switchover rule. This reform has established a minimum level of safeguard against corporate tax avoidance. The ATAD was transposed into national law by EU member states on the first of January 2019, and is part of a wider EU effort to combat corporate tax avoidance and ensure a fair and transparent tax system for all businesses operating within the EU (Commission, 2016).

In recent years, there have been renewed efforts to combat profit shifting and eliminate harmful tax competition, with international organisations, governments, and regulatory bodies taking increasingly proactive measures to address this complex and evolving challenge. In 2021, the international community reached a historic consensus on a dual-pillar approach to tackle tax challenges stemming from economic digitalisation and the involvement of MNEs in the erosion of tax bases and profit shifting. This proposal aims to address ongoing concerns on detrimental tax competition, profit shifting and a harmful ‘race to the bottom’ on corporate tax rates. The GloBE rules will apply to MNEs with a 750-million-euro turnover and will impose a minimum tax rate of at least 15%.

The overall design of Pillar 2 comprises two interconnected domestic rules namely an *Income Inclusion Rule* and an *Undertaxed Payment Rule*. The former rule imposes top-up taxes to MNEs shifting their profits to ease their tax liabilities, whilst the latter denies deductions to the extent of low tax income. Moreover, Pillar 2 also includes the *Subject to Tax Rule* which is designed to guarantee the proper utilisation of tax treaties for their intended purpose of

eliminating double taxation, rather than as a means of avoiding taxation altogether. Hence these provisions will have important implications for the use of tax incentives (OECD, 2021).

### **3. LITERATURE REVIEW**

### **3.1 INTRODUCTION**

This chapter provides a comprehensive overview of key aspects in the realm of corporate taxation and profit shifting. The literature review starts off by dissecting the multifaceted role of corporate tax and its implications for economic structures. This is followed by an analysis of corporate tax competition. Subsequently, I explore the concept of harmful tax practices, particularly profit shifting, and its repercussions on the global financial landscape. The concluding section addresses the challenges faced by small states navigating the terrain of asymmetric competition. This review sets the stage for a deeper understanding of the intricate interplay between corporate taxation, profit shifting and asymmetric competition.

### **3.2 THE ROLE OF CORPORATE TAX IN THE ECONOMY**

Corporate tax is a tax levied on the net profits of a corporation reported within a particular jurisdiction. In a context where numerous governments face reduced revenue, escalating expenses and ensuing financial constraints, raising revenue stands as the foremost role of CIT. CIT serves as the principal avenue for funding essential public services such as developing public infrastructure and upholding law and order (OECD, 2014) . Whilst the main objective for this tax is to raise government revenue, it may also have broader implications on businesses, investment, and overall economic growth (Kagan, 2022).

#### **3.2.1 Tax Rate Determination by Governments and External Influences**

International taxation operates through numerous bilateral tax treaties established between countries, which began to emerge in the 1920s under the guidance of the League of Nations. While some cooperation on tax issues exists, there is no global authority. The United Nations (UN) and the OECD, offer standard tax agreements that serve as the foundation for numerous bilateral arrangements. In situations where taxes are identified as favouring exports or showing bias against imported goods, World Trade Organization (WTO) regulations may also come into play (Siripurapu, 2021). The two main approaches to corporate taxation, termed "worldwide" and "territorial," represent distinct systems for determining which profits are subject to taxation. "Worldwide" taxation encompasses both domestic and foreign profits, while "territorial" taxation focuses solely on profits earned within a country's borders (Matheson et al., 2013).

Over the last two decades, there have been noteworthy changes in CIT policies within the world's major industrialised economies. While all OECD member countries levy taxes on corporate income, their approaches to taxing firms vary significantly. To illustrate, some OECD countries impose taxes on domestic companies based on their global earnings, while others exempt international income from taxation. Furthermore, over the past twenty-five years, numerous OECD countries have significantly reduced their CIT rates, resulting in a high degree of variety in corporate rates and revenue received from corporate tax (Clausing, 2007).

To try explain these rate disparities, Slemrod (2004) analyses data from 90 countries spanning over a period of four years. Several findings are identified in the paper, one of which is that corporate tax rate does not seem to be influenced by a country's revenue needs. The paper also draws interesting conclusions on the role of international competitive pressure on corporate rates. Slemrod observes that whilst the measure of openness is negatively correlated with statutory rates, it is positively correlated with revenues collected as a percentage of Gross Domestic Product (GDP). This finding is similar to Heinemann et al., (2010) who suggest that the rate-cutting phenomena is largely influenced by competitive tax practices and that countries located in close proximity to countries with lower tax rates are significantly more likely to decrease their own tax rates. This idea is also shared by other influential studies such as Andrews (1994), Cerny (1990) and Kurzer (1993) who contend that the global market exerts significant influence on governments to reduce capital taxation levels.

Meanwhile, Mutti (2003) provides an alternative explanation for this rate disparity. The author considers tax rates across a sample of 60 countries in the years 1984, 1992 and 1996, including both small and large countries. The author then introduces three dummy variables to indicate whether a country is poor, small in size, or has an open economy. Mutti's findings indicate that the most substantial tax cuts were predominantly implemented by smaller, open, and middle-income economies which could be attributed to the increased vulnerability and greater dependence on FDI that small countries often experience in their efforts to stimulate economic growth.

### **3.2.2 Corporate Tax Incentives and Corporate Tax Competition**

Tax incentives are commonly employed by both advanced and emerging economies to encourage and draw in economic activity within their territories as they have the potential to significantly reduce tax costs. These incentives may be implemented for various purposes, including rectifying market failures, and stimulating investments that yield beneficial effects for the broader economy, such as fostering Research and Development (R&D) and innovation (OECD, 2022). Developing countries also heavily utilise tax incentives to entice FDI (Harrison & Rodríguez-Clare, 2010). Nevertheless, these incentives can also weaken the government's ability to raise revenue, lead to economic distortions, raise administrative and compliance costs and even potentially spark harmful tax competition (Celani et al., 2022). Poorly designed tax incentives may fall short of their desired outcome, leading to unequal profits for investors and a shortfall in crucial public revenues. Incentives can come in a variety of forms, including investment tax credits, accelerated depreciation, tax holidays and lower tax rates. However, the use of tax incentives has been a source of contention among policymakers and scholars (OECD, 2022).

Corporate tax competition refers to a situation where countries strategically set lower tax rates or offer tax incentives to attract MNEs to locate in their jurisdictions. This practice is driven by the desire to attract foreign investment, create jobs and possible positive spill overs within their economy (Devereux & Griffith, 2003). However corporate taxes, being a significant revenue source for governments and subject to political disputes, have made tax competition a controversial topic. Concerns have been raised by policymakers on how aggressive competition can lead to harmful practices and a race to the bottom in which countries are forced to lower their tax rates to near-zero rates to remain competitive, fearing it could lead to reduced government revenues, potentially compromising essential public funding (Heimberger, 2021). Efforts have been made to enhance tax collaboration within the EU and OECD. However, some argue that it may be challenging, if not impossible, for governments to convincingly commit to a cooperative tax policy stance (Kehoe, 1989). Additionally, uncooperative reductions in corporate taxes can be argued to help jurisdictions stay appealing for FDI, ultimately contributing to economic growth (Azémar et al., 2020). This perspective suggests that tax competition may be favoured over tax cooperation.

### **3.2.3 Advantages and Disadvantages of Corporate Tax Competition**

Corporate tax competition can be beneficial for countries as it encourages governments to improve their business environments by creating attractive tax systems, which in turn can lead to increased investment and economic growth. Due to the single market within the EU and the capital mobility worldwide, MNEs are now spoiled for choice when deciding where they should locate. According to R.H. Gordon & Hines Jr., (2002) the volume and location of FDI is undoubtedly influenced by tax policies since higher rates result in lower after-tax returns, which lessen the incentives for investors to commit capital. As such, many countries rely on tax reductions particularly lowering the effective average tax rates to attract FDI. Obtaining FDI, is the end goal of corporate tax competition and governments are keen on FDI because it has multiple perceived positive spill overs.

FDI is often regarded as the most cost-effective and efficient means of international technology transfer (Campos & Kinoshita, 2002). This makes it a crucial factor in advancing technology and fostering economic growth in host countries. When foreign subsidiaries enter the local market, they benefit from a technological edge due to the transfer of specific assets from the MNEs (Markusen & Venables, 1999). Nonetheless, the primary interest in attracting FDI stems from the anticipated multiplier effect, where knowledge is expected to disseminate from foreign subsidiaries to local businesses. Similarly, in their paper, Blomström & Kokko., (1998) examine spill over effects emanating from attracting MNEs. It is generally agreed that the benefits of FDI on capital creation, employment, exports, and technology outweigh the costs of foreign ownership of local factors of production. The potential of getting modern technology, as well as acquiring managerial and marketing abilities, is possibly the most crucial reason why governments are so keen on attracting FDI. Hence by winning over MNEs to locate locally, host countries hope to obtain access to technologies and skills they do not currently have.

FDI brings not only technological advancements but also various additional advantages. This includes local businesses enhancing production through collaboration with MNE affiliates, utilising MNE technology, and hiring personnel with MNE-specific training. MNEs have notable competitive edges when entering foreign markets, possessing global marketing expertise, expansive distribution networks, and influential lobbying power in their home country. Moreover, through their international operations, Multinational Corporations (MNCs) can assist local businesses in entering the same export markets by building transportation

infrastructure or providing insights into foreign markets. R&D also plays a crucial role, contributing to productivity spill overs. Beyond the advantages of FDI, tax competition encourages transparency and accountability in tax systems, as countries must disclose their practices to attract investments. These combined benefits contribute significantly to a country's development and prosperity (Blomström & Kokko, 1998).

Despite all the merits to tax competition and attracting FDI locally, tax competition may become harmful as it often generates a race to the bottom in corporate tax rates, since rates are often competed down to zero. This is especially so when countries engage in 'tax wars' by competing with each other to offer the lowest tax rates so as to lure economic activity to their shore. The resulting detrimental tax practices erode the sovereignty of other countries while also weakening the funding of the welfare state and the delivery of public goods (Steinmo, 1994). However, not everyone seems to agree with the notion that tax competition will necessarily lead to a race to the bottom situation.

Globalisation sceptics contend that corporations consider not just tax obligations but also the advantages that may result from government expenditures funded by those taxes. Moreover, some jurisdictions have offered tax incentives, locational costs, and advantages as a substitute to lowering tax rates (Held et al., 1999). This argument was also shared by Abbas & Klemm (2013). In their paper the authors examine trends in corporate tax rates and revenue in emerging and developing economies and analyse the extent to which these economies are engaged in tax competition with each other and advanced economies. They conclude that whilst emerging economies are indeed engaged in some degree of competition, it has only been partial rather than a full-scale race to the bottom. The authors contribute this to possibly weaker bargaining power and a greater reliance on tax revenue.

The topic of 'harmful tax competition' has been frequently discussed both at a national level and at an OECD level. During the 1990s, both the OECD and the EU reached consensus that international cooperation was necessary to prevent a decline in revenue and the introduction of distortions in the global allocation of capital (OECD, 1998). Both the European Commission and the OECD have recently taken steps towards international coordination in response to what they perceive as 'harmful' tax competition (Commission, n.d.). Corporate tax competition can be particularly fierce between small countries and those with similar economic conditions, as

they have fewer resources to attract investment and may be more vulnerable to losing business to neighbouring countries (Heimberger, 2021).

### **3.3 TAX AVOIDANCE STRATEGIES**

Transfer pricing, base erosion and profit shifting (BEPS) are three closely related concepts that have significant implications for international taxation as they can lead to revenue losses for governments, create a competitive advantage for MNEs, and distort the allocation of taxable profits between jurisdictions. As a result, international efforts have been made to address these issues. Nonetheless, discussions persist regarding the efficiency of these initiatives and the necessity for additional reforms to establish a fairer and more effective global tax framework (Oyedele, 2013).

#### **3.3.1 Challenges in International Corporate Taxation**

The variation in tax rates among neighbouring countries create opportunities for MNEs to take advantage of these ambiguities and disparities using transfer pricing (Beebejau, 2018). In essence, transfer pricing is an accounting practice whereby MNEs allocate and transfer costs between subsidiaries to minimise their overall tax liabilities. Given the resurgence of harmful tax practices, transfer pricing has become a topic of public discourse and has ceased to be an enigmatic technical issue confined to a limited group of professionals. Such practices lead to a reduction in the taxable income base and the relocation of profits from countries with high tax rates to those with lower rates (Oats et al., 2022).

Harmful tax practices employed by MNEs adversely impact both developed and developing countries since the former experience reduced tax revenue and the latter is subject to exploitation by these MNEs. However, Sebele-Mpofu et al. (2021) conclude that transfer pricing has more significant consequences on developing jurisdictions when compared to developed jurisdictions, particularly since developing countries, often small states, are inherently vulnerable and prone to abuse.

BEPS refer to tax planning strategies employed by MNEs to take advantage of discrepancies and inconsistencies in tax regulations to evade and reduce their tax obligations (OECD, n.d.). BEPS have become a major concern for policymakers around the world as they threaten to undermine the fairness and integrity of national tax systems. Base erosion pertains to the

strategic use of financial measures and tax planning strategies to diminish a company's taxable profits in a particular jurisdiction. This is typically achieved by organising income in a manner that garners more favourable tax advantages or by identifying means to offset particular expenditure against taxable income, resulting in a lower tax liability for the MNE (Guidecoq, 2023).

Profit shifting, on the other hand, entails directing profits toward jurisdictions with low tax rates, frequently accomplished by adjusting transfer prices or leveraging intangible assets such as intellectual property. This allows MNEs to reduce their overall tax liability, often at the expense of the countries where the profits were actually earned (OECD, 2013). Despite all efforts, BEPS remains a complex and challenging issue, as MNEs continue to use sophisticated tax planning strategies to minimise their tax liability.

### **3.3.2 Channels of Profit Shifting**

There are three main techniques MNEs use to engage in profit shifting. Firstly, MNEs can manipulate the pricing of intra-group exports and imports. This involves subsidiaries located in high-tax countries selling goods and services to affiliated entities in low-tax countries at reduced prices and, conversely, purchasing from them at elevated prices. Secondly, MNCs have the ability to shift profits by means of interest payments within their group. Affiliates located in high-tax regions may secure loans, potentially at comparably higher interest rates, from affiliates in low-tax countries. Lastly, firms can relocate intangible assets like trademarks, patents, logos, algorithms, or financial portfolios, produced or managed in high-tax jurisdictions to their subsidiaries in low-tax jurisdictions. In this way, the latter subsidiaries can generate income in the form of royalties, interest, or payments from their end customers (Devereux & Vella., 2017).

### **3.3.3 Enforcement & Regulations**

In theory, strict and rigorous enforcement has the potential to restrain profit shifting through the avenues previously mentioned. To tackle these unfair tax practices, certain countries have adopted the "arm's length principles" to guarantee that transfer prices match the rates established for comparable transactions between unrelated and independent parties (Mongrain et al., 2023). However, tax authorities that have limited resources face challenges when it comes to enforcing the arm's length principle, and in situations involving intangible

transactions, the principle is frequently not clearly defined in a conceptual sense (Devereux & Vella., 2017).

In their study Lohse et al. (2013) explore the effectiveness of transfer pricing laws in curbing profit shifting. The authors classified countries based on how stringent their adherence to the arm's length principles is, primarily through an assessment of documentation requirements. According to the Lohse and Riedel index, some countries have adopted stringent standards, such as the UK, which scored a 4 on a scale ranging from 0 to 5. In contrast, some other countries, like the United States (US), have fewer exacting standards, receiving a score of 3. The findings of the paper indicate regulations related to transfer pricing may not be as effective as intended in limiting international income shifting. Despite the existence of these laws, European MNEs appear to be more likely to engage in income shifting practices towards low-tax jurisdictions. This implies that the regulations may not be robust enough or that companies find ways to work around them (Mongrain et al., 2023).

Numerous countries have implemented regulations aimed at curbing thin capitalisation<sup>1</sup>, typically by establishing specific safe-haven debt-to-equity ratios that trigger the cessation of tax deductions once breached. For instance, the UK enforces a stringent 1:1 ratio. On the other hand, countries such as France and the US have chosen less stringent ratios of 1.5:1 and some countries have even more relaxed ratios. Between 1996 and 2009, the percentage of OECD countries with thin-capitalisation rules went up from 45% to 70%. Nevertheless, the typical debt-to-equity ratio, which is considered a safeguard, stayed relatively constant at around 3:1 during this time (Mongrain et al., 2023).

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<sup>1</sup> Thin capitalisation is when a firm raises a large amount of its capital through debt financing as opposed to equity financing (OECD, 2012)

### **3.4 SMALL STATES AND ASYMMETRIC TAX COMPETITION**

Small countries are inherently vulnerable due to unique disadvantages related to their small size, geographical insularity, remoteness, and susceptibility to natural calamities. These factors often lead to difficulties in obtaining both sufficient and diverse access to capital and labour resources (Briguglio, 1995).

#### **3.4.1 Economic Characteristics of SIDS**

The definition for being a small state can be very loosely interpreted since smallness can be looked from several angles (Maass, 2009). For example, Luxembourg is geographically small. However, its' economy resembles more of a large state than that of a small state. In a paper written by Armstrong & Read, (2003), the authors identify a salient list of economic characteristics often used as a criterion to determine whether a state is small or not namely a small domestic market, limited domestic resource base, narrowness of domestic output, exports and market, high degree of structural openness to trade and additional transport and communication costs. Even though their economic attributes can have adverse growth consequences, small states can still be successful in developing and implementing effective domestic policies that foster economic growth. Malta and Qatar are among the success stories of small states; testament that despite their disadvantaged smallness they can still manage to acquire higher levels of FDI (World Bank, 2016).

#### **3.4.2 Small States and FDI**

According to Teixeira & Nascimento, (2019), FDI can be an important source of economic growth and development for small states. Foreign investment can bring in new capital, technology and expertise that can help small states diversify their economies, create jobs, and increase their competitiveness in the global market. As a result, it is generally agreed that small states value FDI more than a large state would. While jurisdictions of comparable size tend to have similar motivations for reducing corporate taxes, when competing with larger countries, small countries are more inclined to implement competitive tax cuts in hopes of attracting the FDI (Bucovetsky 1991; Wilson 1999).

The topic of FDI and the factors influencing it has spurred numerous scholarly contributions in the fields of economics and international management. The limited research that considers FDI flows into developing countries highlights that due to significant structural challenges,

these developing countries must fulfil unique requirements, distinct from those of developed countries, to attract FDI. The paper by Teixeira & Nascimento, (2019) analyses the reasons and motivations behind FDI locating in less appealing markets, with a specific emphasis on small countries situated in Sub-Saharan Africa, namely São Tomé and Príncipe.

Using robust logistic estimations on a dataset comprising 56 Portuguese companies engaged in trade with African nations, the researchers illustrate that, when dealing with small economies, the significance of institutional factors and strategies aimed at acquiring resources takes precedence over the significance of internalisation and location factors linked to market size and dynamics. Additionally, the authors observed that the attributes of foreign firms, specifically their size and level of human capital, play a critical role in determining which firms are more likely to invest in what are considered 'unattractive' markets. Consequently, their findings underscore the vital importance of institutional factors in attracting FDI these less appealing markets (Teixeira & Nascimento, 2019).

Similarly, Forte & Neves, (2021)'s paper delves deeper into the factors influencing FDI in small countries. By employing an econometric model, that incorporates panel data encompassing 42 small countries from 2005 to 2019, the researchers note that the most influential factors for FDI in small countries are the quality of their human capital and the availability of infrastructure. Besides these two primary factors, the control of corruption, the presence of natural resources, and the level of a country's openness also hold significance.

Interestingly, Forte & Neves, (2021), note that while the corporate tax rate is a factor, it doesn't rank among the top drivers. The authors conclude their study by emphasising that although small states may have limited influence on the global economy due to their small size, FDI still plays a significant role in ensuring the sustainability of these small states. Therefore, researching the impact of FDI on the social and economic development, as well as the financial sustainability and economic growth, of small states can be a valuable endeavour.

### **3.4.3 Asymmetric Tax Competition**

Haufler & Wooton's (1999) tax competition model is a pioneering contribution in the field of asymmetric competition. In their paper, the authors employ a two-country model of asymmetric size to attract a foreign firm given their disposal to multiple tax instruments. The model

considers two alternative settings. In the initial scenario, countries possess only a lump-sum profit subsidy option but face equal transport costs for imports. Under these conditions, both countries will consistently opt to provide subsidies to the firm. Additionally, the maximum subsidy available is higher in the larger country.

In the second scenario, countries are provided with an additional instrument; either a tariff or a consumption tax. In this case, the larger country will no longer competitively underbid its smaller counterpart, and its optimal offer may involve a positive profit tax. The authors conclude that in both scenarios, the foreign monopolist will always prefer to establish itself in the larger country, even if the government imposes a positive tax rate. This preference arises because the larger country consistently enjoys a geographic advantage over the smaller one (Haufler & Wooton, 1999).

Similar to Haufler and Wooton (1999)'s paper, Sanjo (2012) also endeavours to analyse tax competition through a two-country model with varying market sizes. However, Sanjo's approach differs in that he introduces a trade-off between country risk, which signifies a locational disadvantage that foreign firms encounter when investing in a host country, and country size, which represents a locational advantage. The author's analysis considers two scenarios. In the first scenario he investigates a situation where country risk is the same in the small and large country whilst in the second scenario the country risk is different. The distinction between these scenarios is determined by factors such as geographic proximity or the similarity of various spatial attributes in the host countries.

The findings indicate that when comparing a high-risk country with a large market size to a low-risk country, under the first scenario where the country risk probability is the same, selecting the high-risk larger country is advantageous for the firm, even if the host country imposes a lump-sum tax. However, in the second scenario where there are different country risk probabilities, the firm's primary concern is whether the host country is high-cost or low-cost, rather than its risk level. Consequently, these results are favourable for smaller countries that might perceive themselves as disadvantaged compared to larger countries. The author's conclusions suggest that even a small country can potentially become an attractive investment destination for a foreign firm if it offers a low-cost environment. These findings differ from those of Haufler and Wooton (1999).

In a paper written by Mongrain et al., (2023) the authors also use a simple two-country model with the addition of a parasitic tax haven, to address the correlation between tax havens which are often small states, enforcement against profit shifting, and tax competition. By setting up the tax competition model the authors try to establish the circumstances in which a government may favour lenient measures for controlling profit shifting. In the paper, the authors note that more stringent enforcement serves to dissuade profit-shifting activities by increasing the expenses incurred by corporations that breach regulations. When profit shifting responds significantly to control measures, stricter enforcement becomes advantageous. The authors also note that the management of profit shifting influences the determination of tax rates. Therefore, rigorous enforcement may not be ideal if it leads to reduced tax rates—a phenomenon they refer to as the "tax competition effect".

### **3.5 SYNTHESIS AND IDENTIFIED RESEARCH GAPS**

The literature review conducted a comprehensive analysis of four critical areas within international taxation namely corporate tax competition, profit shifting and harmful tax practices, enforcement mechanisms aimed at curtailing profit shifting and asymmetric competition. Additionally, the chapter concluded by providing an overview of some of the most prominent theoretical models which have been widely used over the years. The aim of this review is to provide an overview of the existing body of work and identify areas which warrant further research.

As can be noted from the chapter, the prevailing body of literature pertaining to FDI flows predominantly centres on large-developed economies. While there has been a growing emphasis on small countries in recent years, due to their increasing economic significance, research in this domain remains constrained. Moreover, several theoretical models, including Haufler and Wooton's (1999) workhorse model, tend to focus solely on either tax competition or profit shifting, rather than integrating both aspects. Additionally, a recurring deficiency in prior studies pertains to the oversight of enforcement mechanisms within the realm of international taxation. These identified research gaps warrant further examination to enhance the comprehensiveness of research in this field.

## **4. METHODOLOGY**

## **4.1 INTRODUCTION**

The methodology chapter serves as the cornerstone of this thesis. Through the employment of an applied theoretical model, I aim to bridge the gap between theory and practice, offering a practical approach to addressing real-world challenges and questions within my research domain. In this chapter, I briefly explain what an economic model is and thoroughly examine the rationale behind the choice of methodology, elucidating why a model represents the most suitable approach for my research. This chapter is followed by an analysis of a model's inherent strengths and weaknesses, all while emphasising its direct relevance to the attainment of my research objectives. This chapter seeks to illuminate the research approach taken which will in turn enhance the transparency and rigour of my study, ultimately laying the foundation for a robust and reliable investigation into the chosen subject matter.

## **4.2 WHAT IS AN APPLIED THEORETICAL MODEL**

An economic model is a simplified conceptual framework that is used as a basis for understanding and addressing real-world problems or phenomena. An economic model can fall under one of two broad classes: theoretical or empirical (Ouliaris, 2011). This dissertation employs an applied theoretical model as I combine theoretical principles and concepts with practical applications in a specific context.

Economic models generally comprise of a collection of mathematical equations that articulate a theoretical framework for understanding economic behaviour. The objective is to include an adequate number of equations that yield valuable insights into the behaviour of rational agents, in my case governments and the MNE, or the functioning of an economy. The composition of these equations is a deliberate effort to streamline the complexities of reality, often entailing simplifying and critical assumptions such as the governments of the two potential host countries possessing perfect information (Ouliaris, 2011).

Models can vary in quality, and what distinguishes a good model lies in several key criteria. A model's effectiveness is gauged by its capacity to faithfully represent the real-world phenomenon it addresses, its proficiency in making accurate predictions, and its ability to strike a balance between simplicity, capturing essential relationships, and the omission of extraneous details. Furthermore, a quality model should align with empirical evidence and offer valuable

insights that enhance comprehension or guide decision-making (Ouliaris, 2011). According to Gabaix & Laibson, (2008) an economic model should have seven key properties to be considered a good model namely, parsimony, tractability, conceptual insightfulness, generalisability, falsifiability, empirical consistency, and predictive precision.

### **4.3 JUSTIFICATION OF METHOD**

The selection of a model as the primary methodology for this research is grounded in several compelling reasons that stem from the nature of the research questions, the objectives, the limited availability of real-world data and the broader context of the study. This section elaborates on the rationale behind this choice, highlighting the strengths and advantages it offers while acknowledging its potential limitations.

The nature of my research question and focus, demands a framework that extends beyond the confines of mere theoretical or data analysis but requires a multifaceted approach that seamlessly adapts to real-world contexts. An applied theoretical model, in this regard, serves as an invaluable bridge between theory and practice, facilitating a comprehensive exploration of how theoretical concepts manifest within the intricate dynamics of practical complicated real-world scenarios. This connection between theory and real-world application is central to my research objectives. It empowers the study to assess the practical validity of well-established theories, unravel the influence of external factors, and formulate hypotheses that can guide future empirical research, even in the face of limited current data availability.

An applied theoretical model stands as the most suitable approach to address my research question due to the scarcity of available data. In situations where empirical data is limited, relying solely on empirical analyses becomes challenging and may yield inconclusive results. An applied theoretical model offers the advantage of drawing upon existing knowledge and theories to construct a framework that can generate meaningful insights and predictions even when data is sparse. By leveraging well-established theoretical principles, I can develop a conceptual foundation that enables me to explore and understand the underlying dynamics of the research question, making it an ideal fit for effectively navigating the constraints posed by limited data availability.

The application of a theoretical model not only accommodates limited data but also provides the flexibility to test various scenarios under different economic environments. Applied theoretical models are adaptable in this way and can be tailored to best answer specific research questions and objectives, making them versatile tools for investigating a wide range of topics. Through the theoretical framework, I can construct and manipulate hypothetical scenarios that represent a wide range of economic conditions and variables. This flexibility allows me to explore diverse scenarios, test hypotheses, and assess the potential outcomes of various policy interventions or market conditions. Through both theoretical modelling and then subsequently conducting numerical simulations, I gain valuable insights into the potential dynamics of the research question, even in the absence of extensive empirical data, making it a powerful tool for robust and comprehensive analysis.

#### **4.4 STRENGTHS AND WEAKNESSES**

Economic models, while invaluable in shedding light on complex economic phenomena, are not without their limitations. By critically assessing their strengths and weaknesses, I aim to provide a well-rounded understanding of the role these models play in economic analysis and decision-making.

Perhaps the most obvious strength of models is their ability to serve as simplified representations, distilling complex real-world economic systems into manageable frameworks that facilitate comprehension and analysis. In constructing models, excessive detail is consciously omitted, opting instead to focus on the most pertinent factors and relationships. This selective simplification is akin to the principle of parsimony; there is no need to create an excessively complicated model to explain a phenomenon. A well-constructed model relies on specific assumptions and the omission of non-essential particulars, rendering it more accessible and conducive to deriving meaningful insights (Quickonomics, 2020).

A significant strength of economic models lies in their predictive power. These models are designed to simulate and forecast economic behaviours and outcomes under various scenarios. By incorporating relevant variables and established economic relationships, they enable policymakers to make informed predictions about potential consequences of different policy

interventions. This predictive ability is invaluable for decision-making, as it provides a glimpse into the potential future impacts of economic choices (Gabaix & Laibson, 2008).

While the application of a theoretical model offers numerous advantages, it is essential to acknowledge potential limitations. These may include oversimplification of complex phenomena, limitations in the generalisability of findings, and challenges in operationalizing abstract theoretical constructs into measurable variables.

In his latest book, “Economics Rules,” Rodrik (2015) asserts that models are never entirely accurate representations of reality but can still contain elements of truth within them. He emphasises that comprehending the world often necessitates simplification. However, the problem arises when economists, after gaining specific insights into economic mechanisms, disregard the simplifying assumptions inherent in their models, leading them to believe that these models perfectly reflect reality. Consequently, these initial insights can transform into sweeping generalisations or universally applicable truths, such as the belief that trade is universally beneficial or that taxes are invariably detrimental. In essence, economists may start treating "a model as the model," erroneously considering it universally relevant and applicable in all circumstances.

Whilst no economic model can perfectly capture reality, the very process of constructing, testing, and refining models compels economists and policymakers to re-evaluate their understanding of how an economy operates. Consequently, this encourages scientific discussions about the factors influencing economic behaviour and what should, or should not, be done to deal with market failures (Ouliaris, 2011).

## **4.5 COMPONENTS OF THE GAME**

A game comprises of three fundamental components namely the players, actions, and timing. These elements are briefly described below and are further evaluated in the Model chapter.

### **4.5.1 Players**

The game consists of four key players, the home country’s government, the two potential host countries’ governments and the MNE. The two host countries are in competition to attract the MNE, which is owned by the home country, to open its subsidiary within their jurisdiction.

The key difference between the two countries is their size; Country A is a small economy whilst Country B is a large economy. The MNE is profit-maximising, and its location determination is exclusively dependent on the potential profits in the two countries.

#### **4.5.2 Actions**

The model considers three key scenarios which describe different economic environments. The countries have two key instruments at their disposal to attract the MNE: tax rates and enforcement rates. These two instruments are varied in each case within the three scenarios to determine their influence on the location decision.

#### **4.5.3 Timing**

The timing of the game includes two stages.

- Stage 1: MNE decides where to locate given the exogenously determined tax rate and enforcement rate. This stage involves evaluating three economic scenarios.
- Stage 2: MNE determines the transfer price of intermediate good.

The model is solved through backwards induction which is a process of analysing a game from the end to the beginning. This means that the game will start with the second stage and then proceed to the first stage. In this case backwards induction is possible since there is perfect information and a known endpoint. While backward induction is a powerful tool for decision-making in situations with perfect information, it may not always be applicable in real-world scenarios where information is incomplete or uncertain (Watson, 2013).

## **5. THE MODEL**

## 5.1 INTRODUCTION

In the following chapter I present the theoretical model and derive its main results. To provide clarity and context, the chapter starts by elucidating the fundamental components of the model, including its framework, the key players involved, and the timing of the game. This initial section also outlines the key assumptions that underlie the model throughout. The objective here is to establish a solid foundation for a thorough examination of the model, providing insights into its functioning and how it will be applied to understand the complex dynamics of profit shifting and tax competition. Following this, I proceed by solving the model by backwards induction, first determining the price of transfer pricing, and then defining the firms' location based on various economic scenarios. Subsequently, the next chapter includes a series of simulations aimed at validating the model presented here, along with a discussion of the results.

## 5.2 FRAMEWORK

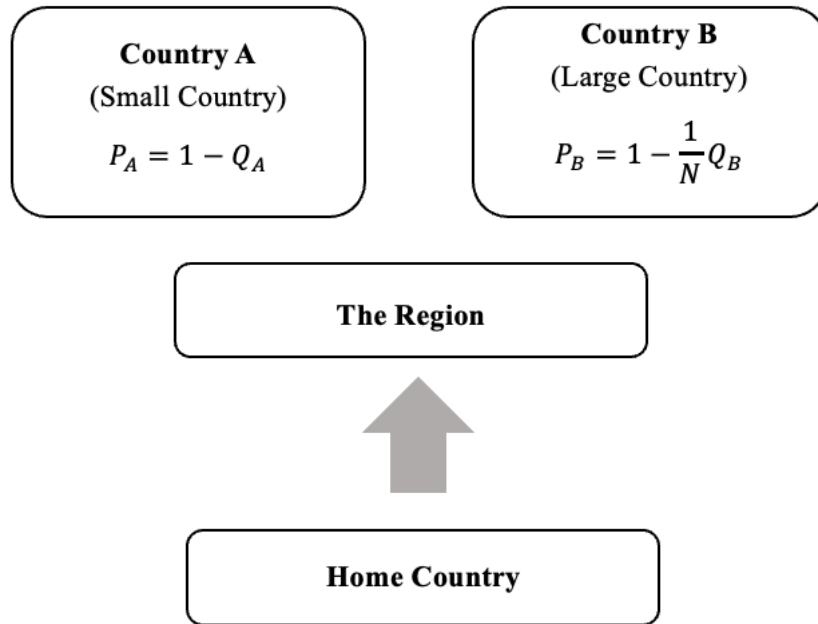
The model describes an environment with an MNE that wants to invest in a regional market that consists of two countries. The MNE's parent company is owned outside the region in Country H, the home country, while the region consists of two potential host countries, labelled Country A and Country B (see Figure 4). The key difference between Country A and Country B is that the former is a small country whilst the latter is a large country. The size of the countries is reflected in their respective inverse demand functions:

$$P_A = 1 - Q_A \dots \text{(a.1)}$$

$$P_B = 1 - \frac{1}{N} Q_B \dots \text{(b.2)}$$

where  $P_A$  is the market price of the good sold by the MNE in country A,  $P_B$  is the market price of the good sold by the MNE in country B,  $Q_A$  is the quantity of the good sold by the MNE in market A,  $Q_B$  is the quantity of the good sold by the MNE in market B, and  $N$  is a parameter reflecting the size differential between the two countries, taking values greater or equal to one.

Figure 4 - Set-Up of Model



As noted above, asymmetry is introduced through the parameter  $N$  which makes total demand in Country B,  $N$  times larger than total demand in Country A. To see this, note that rearranging the inverse demand functions (a.1) and (b.1), by solving for  $Q_A$  and  $Q_B$ , yields  $Q_A = 1 - P_A$  and  $Q_B = N(1 - P_B)$ . It follows that if  $P_A = P_B$ , then  $Q_B$  is  $N$  times greater than  $Q_A$ . This highlights the market advantage Country B has, owing to its favourable market size.

When considering the FDI's investment in the region, the model excludes the possibility that the parent MNE directly exports from Country H to meet the region's demand<sup>2</sup>. This means that the MNE must open a subsidiary in one of the two countries to serve the regional demand. Hence the MNE has two options listed below:

- Set up a production facility in Country A and export to Country B or
- Set up a production facility in Country B and export to Country A.

While there are no trade barriers and restrictions, exporting within the region, from Country A to Country B or vice versa, comes at a per unit transport cost  $\tau \in [0,1]$  associated with exporting a unit of the product from the subsidiary to the other country. For exports to occur,

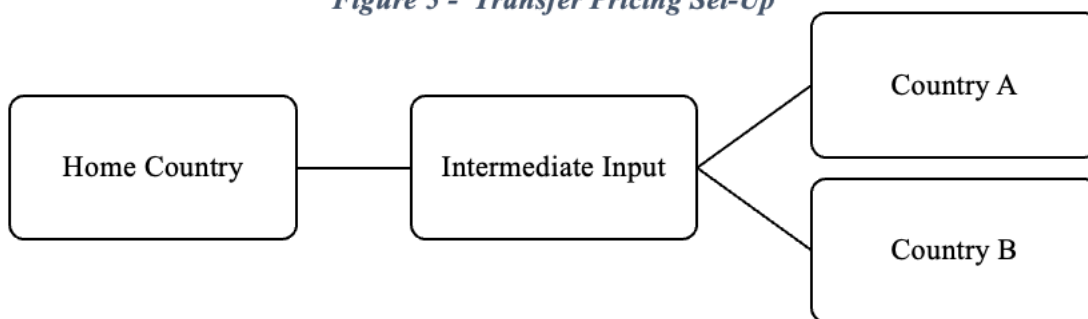
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<sup>2</sup> This may be because exporting to the two countries from outside the region is too costly and thus unprofitable.

the trade must be profitable. Moreover, the MNE faces a fixed cost  $F$  when establishing a plant in either Country A or Country B. This cost is substantial enough to guarantee that the MNE will not establish plants in both countries. For the sake of analytical simplicity, the model assumes that marginal costs are zero.

All the above is similar to Haufler and Wooton's (1999) workhorse model. However, this model differs from their model by incorporating the parent MNE and its interactions with its subsidiary, a relationship which is not captured in the workhorse model. In general, MNEs have internal markets where goods and services are exchanged through transfer prices. These prices are not subject to external market influences but are solely managed by the parent company. In this case, as is often the case in the real world, transfer prices are used to minimise global tax payments. Hence, the model allows for profit shifting through the establishment of a subsidiary which requires the parent company to provide an intermediate input. For the model's purpose it suffices to assume that producing a single unit of the product in the subsidiary necessitates one unit of an intermediate input provided by the parent company. The price of this intermediate input is  $\delta_j$  where  $j \in \{A, B\}$ .

*Figure 5 - Transfer Pricing Set-Up*



Since the marginal cost of production is normalised to zero, the true price of this intermediate good is also zero and so any transfer price which is not zero will depict either an overpricing (if  $\delta_j > 0$ ) or an under-pricing (if  $\delta_j < 0$ ). In the case where  $\delta_j = 0$  transfer pricing is considered fair or at arm's length. However often times the parent company under-prices so that reported profits in the subsidiary, which offers more favourable tax conditions, are greater than in the case of over-pricing or fair pricing.

The model does not allow for tax evasion and so any deviations from the true price must be explained and documented to tax authorities. Profit shifting through transfer pricing is not

costless and comes at a cost which is quadratic and dependent on the difference between transfer price and the fair price given as,  $\frac{1}{2}\gamma_j\delta_j^2$  where  $\gamma_j \in [0,1]$ . This cost of transfer pricing is influenced by Governments via monitoring and the design of regulations. This is reflected in the exogenously determined parameter  $\gamma_j$  where  $j \in \{A, B\}$  which represents the imposed enforcement levels by tax authorities in implementing profit shifting regulations. This is a key parameter since it determines the extent to which taxable profits are mobile. In this model, enforcement is also used as an instrument to attract an MNE to locate in one of the two countries since more lenient enforcement makes transfer pricing cheaper for the MNE.

Tax wise, each country sets a source-based profit tax such that the MNE only pays tax in the country where it is operating, in this case in either Country A or Country B. Countries employ an ad valorem CIT rate  $t_j$  where  $j \in \{A, B, H\}$ . Similar to the enforcement level, tax is also exogenously determined and is varied under different scenarios to get insights on tax competition. However, the analysis generally presumes that  $t_H > t_j$  where  $j \in \{A, B\}$ , as otherwise, the parent company will not have an incentive to engage in transfer pricing.

### **5.3 THE GAME**

The timing of the game is as follows. Firstly, the MNE decides where to locate given the exogenously determined tax rate and enforcement rate. In this stage three economic scenarios are considered. In the second stage, the MNE determines transfer price of intermediate good and the quantity of how much of the final good to produce. Prior to considering the three scenarios, the endogenous variables are solved first assuming that the MNE locates in Country A and then doing the same assuming MNE locates in Country B. The profit functions for Country A and Country B are then compared to determine equilibrium location. As already indicated in the Methodology chapter, the model is solved backwards. While this chapter includes the main results of the model, the full mathematical workings and proofs can be found in the Appendix section.

## **Stage 2 – MNE determines transfer price of intermediate input**

In the second stage of the game, the model delves into the intricacies of the MNE's decision-making process. Taking taxes and enforcement levels as given, the MNE proceeds to strategically determine the transfer price for the intermediate good and how much to sell in each country. This is first examined assuming that the MNE selects Country A as its location and then replicating the same process assuming the MNE locates in Country B.

The profit functions if the MNE locates in Country A and Country B are respectively denoted below:

MNE locates in Country A

$$\pi_A^* = (1 - t_A) \left[ (1 - Q_A^A) Q_A^A + \left( 1 - \frac{1}{N} Q_B^A - \tau \right) Q_B^A \right] + (\delta_A)(t_A - t_H)[Q_A^A + Q_B^A] - \frac{1}{2} \gamma_A \delta_A^2 - F$$

... (a.2)

MNE locates in Country B

$$\pi_B^* = (1 - t_B) \left[ (1 - Q_A^B - \tau) Q_A^B + \left( 1 - \frac{1}{N} Q_B^B \right) Q_B^B \right] + (\delta_B)(t_B - t_H)[Q_A^B + Q_B^B] - \frac{1}{2} \gamma_B \delta_B^2 - F$$

... (b.2)

where  $Q_i^j$  represent the sales in Country i from locating in Country j.

Profit functions (a.2) and (b.2) represent the after-tax global profit earned by the MNE if its sets up in Country A and Country B respectively. The functions can be 'divided' into three parts. The first term on the left hand-side of the profit function represents the revenue generated by the MNE operating in Country A/B and exporting to Country B/A given transport cost  $\tau$ . This part of the function also accounts for the tax rate in Country A/B, the market size in both countries and adjusts for potential tax liabilities.

The second part of the profit function represent the profits generated from transfer pricing activities. This is influenced by the difference in tax rates between host country and home country, as well as the volume of sales in both Country A and Country B. The third part of the profit function accounts for the related cost of engaging in transfer pricing and the establishment of a plant. The term  $\frac{1}{2} \gamma_j \delta_j^2$  represents the cost incurred due to profit shifting,

and it reduces overall profit. The quadratic relationship implies that as enforcement ( $\gamma_j$ ) increases, the cost of profit shifting compliance also increases. Fixed costs ( $F$ ) are also subtracted from the profit function since this reduces overall profit.

Maximising (a.2) with respect to  $Q_A^A$ ,  $Q_B^A$  and  $\delta_A$  solves for the values that maximise profits. The equilibrium quantity sold in Country A and exported to Country B is given by:

$$Q_A^A = \frac{(1-t_A)+\delta_A(t_A-t_H)}{2(1-t_A)} \dots \text{(a.3)}$$

$$Q_B^A = \frac{N[(1-t_A)(1-\tau)+\delta_A(t_A-t_H)]}{2(1-t_A)} \dots \text{(a.4)}$$

While the optimal transfer price of intermediate good is given by:

$$\delta_A = \frac{(t_A-t_H)(Q_A^A+Q_B^A)}{\gamma_A} \dots \text{(a.5)}$$

Similarly, maximising (b.2) with respect to  $Q_A^B$ ,  $Q_B^B$  and  $\delta_B$  solves for the values that maximise profits. The equilibrium quantity sold in Country B and exported to Country A is given by:

$$Q_A^B = \frac{(1-t_B)-\tau(1-t_B)+\delta_B(t_B-t_H)}{2(1-t_B)} \dots \text{(b.3)}$$

$$Q_B^B = \frac{N[(1-t_B)+\delta_B(t_B-t_H)]}{2(1-t_B)} \dots \text{(b.4)}$$

While the optimal transfer price of intermediate good is given by:

$$\delta_B = \frac{(t_B-t_H)(Q_A^B+Q_B^B)}{\gamma_B} \dots \text{(b.5)}$$

The relationship expressed in (a.5) and (b.5) highlights the interplay of factors influencing transfer pricing within MNEs operation in Countries A/B and Country H. The tax differential between the host country and the parent country plays a pivotal role. As the differential widens, it increases the incentive to engage in profit shifting through transfer pricing. Moreover, an increase in host country's market size is associated with higher transfer pricing. Conversely, there is an inverse relationship between enforcement levels and profit shifting. A more stringent enforcement regime, represented by a high enforcement parameter, acts as a dampening force on transfer pricing as the parent company is less incentivised to engage in transfer pricing. This intricate dynamic illustrates the nuanced nature of transfer pricing decisions which are shaped by a complex interplay of tax differentials, market size and enforcement measures against profit shifting.

The sign of transfer price in equation (a.5) and (b.5) is entirely determined on the disparity in tax rates between host and home country. To illustrate, if the tax rate in the home country is higher than that in the host country, the MNE will find it advantageous to shift profits from the home country to the host country. This is achieved by under-pricing the intermediate input (i.e., the MNE's parent company charges the subsidiary a price for the intermediate good that is below its marginal cost of production). Conversely, if the home country levies lower taxes than the host country, the optimal transfer price will be positive, leading to a relocation of profits from the host country to the home country. Profit shifting will only occur if it is profitable to do so.

From (a.5) and (b.5) one can also note that in addition to the tax differential, the magnitude of the transfer price is influenced by both the factor representing the costs associated with transfer pricing, as well as the extent of intra-firm trade. When the coefficient representing transfer pricing costs is smaller, the absolute value of the transfer price becomes larger. Conversely, the higher sales in the region, the greater the incentive for the MNE to engage in profit shifting. Since transfer pricing costs are assumed to be non-proportional to intra-firm trade, this heightened benefit from profit shifting leads to more assertive transfer pricing strategies—resulting in more substantial deviations from the actual price.

### **Stage 1 – MNE decides where to locate**

Following the second stage, where the MNE determines the transfer price of intermediate good and quantities to be produced, these values will be used to ascertain the optimal level of profits to be shifted. A preliminary analysis of the two profit functions will reveal the discernible asymmetry between the two countries, providing an initial insight into the distinctive dynamics at play. After determining the two profit functions, a thorough comparison will be conducted to assess three distinct scenarios. For each case, the model will ascertain the most profitable location for the MNE. This strategic choice will be singularly determined by the country that promises the highest yield in profits, shaping the ultimate trajectory of the MNE's operations.

Substituting the optimal quantities to be produced, given by (a.3) and (a.4), into the optimal transfer price (a.5) gives the following:

$$\delta_A = \frac{(1-t_A)(t_A-t_H)(1+N(1-\tau))}{2\gamma_A(1-t_A)-(N+1)(t_A-t_H)^2} \dots \text{(a.6)}$$

Similarly, substituting the optimal quantities to be produced, given by (b.3) and (b.4), into the optimal transfer price (b.5) gives the following:

$$\delta_B = \frac{(1-t_B)(t_B-t_H)(N+1-\tau)}{2\gamma_B(1-t_B)-(N+1)(t_B-t_H)^2} \dots \text{(b.6)}$$

The substitution serves the purpose of simplifying the original equation and making the relationship between transfer price ( $\delta_A/\delta_B$ ) and the economic factors i.e., tax differential, intra-firm trade and market size and enforcement level, more explicit. The denominator in (a.6) and (b.6) must be positive to ensure that the transfer price is consistent with MNE's objective of maximising its profitability. A negative denominator would indicate that the MNE is incurring substantial costs related to its transfer pricing strategies, which is contrary to its profit maximising goal.

When comparing expressions (a.6) and (b.6) it becomes evident that under similar conditions i.e., when both countries have the same tax rate ( $t_A = t_B$ ) and enforcement rate ( $\gamma_A = \gamma_B$ ), the MNE will opt for a more assertive transfer pricing approach when it is situated in the larger country. The intuition of this builds on the characteristic of transfer pricing, i.e., that the extent of profit shifting is contingent on the scale of the transaction. As can be observed in the two expressions, the MNE faces a larger market and has the potential for higher intra-firm trade if

it locates in Country B and hence this leads to a more aggressive transfer pricing strategy. The full workings showing that Country B would have a more aggressive transfer pricing strategy and would hence have a lower value of  $\delta$ , can be found in the Appendix under Proof 1.

For the purpose of determining optimal profits to be shifted if MNE locates in Country A, expression (a.3) and (a.4) are rewritten as follows:

$$(1 - Q_A^A)Q_A^A = \frac{(1-t_A)^2 - \delta_A^2(t_A - t_H)^2}{4(1-t_A)^2}$$

$$\left(1 - \frac{1}{N}Q_B^A - \tau\right)Q_B^A = \frac{N[(1-t_A)^2(1-\tau)^2 - \delta_A^2(t_A - t_H)^2]}{4(1-t_A)^2}$$

These are then inputted in the original profit function, given by (a.2) to determine optimal profits to be shifted:

$$\pi_A^* = \frac{(1-t_A)}{4} \left[ 1 + N(1-\tau)^2 + \frac{(t_A - t_H)^2(1+N(1-\tau))^2}{2\gamma_A(1-t_A) - (N+1)(t_A - t_H)^2} \right] \dots \text{(a.7)}$$

Similarly, for the purpose of determining optimal profits to be shifted if MNE locates in Country B, expression (b.3) and (b.4) are rewritten as follows:

$$(1 - Q_A^B - \tau)Q_A^B = \frac{(1 - t_B)^2(1 - \tau)^2 - \delta_B^2(t_B - t_H)^2}{4(1 - t_B)^2}$$

$$1 - \frac{1}{N}Q_B^B)Q_B^B = \frac{N[(1 - t_B)^2 - \delta_B^2(t_B - t_H)^2]}{4(1 - t_B)^2}$$

These are then inputted in the original profit function, given by (b.2) to determine optimal profits to be shifted:

$$\pi_B^* = \frac{(1-t_B)}{4} \left[ N + (1-\tau)^2 + \frac{(t_B - t_H)^2(N+1-\tau)^2}{2\gamma_B(1-t_B) - (N+1)(t_B - t_H)^2} \right] \dots \text{(b.7)}$$

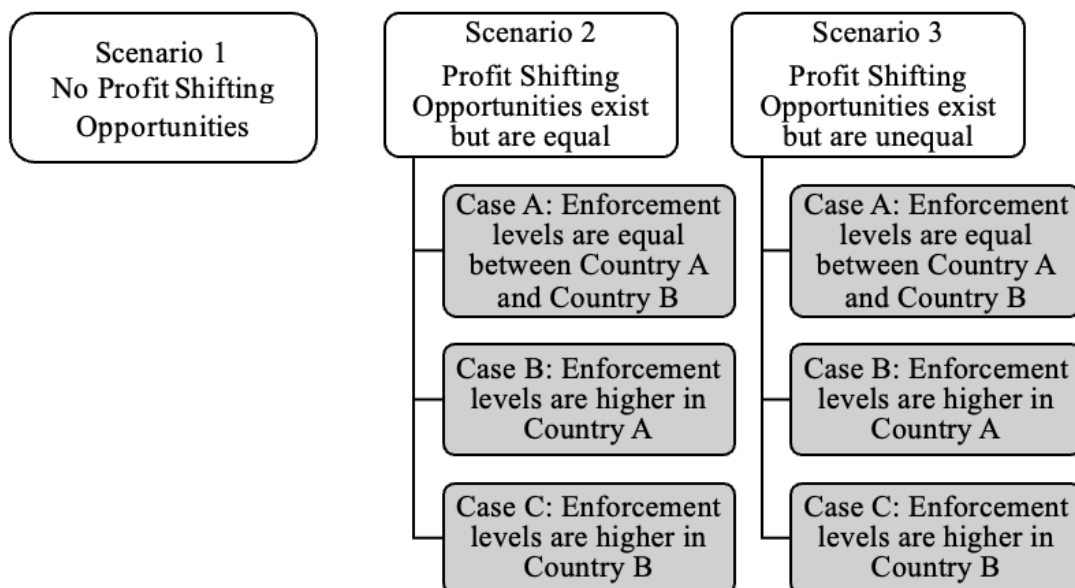
Equations (a.7) and (b.7) represent the estimated after-tax profits for the MNE located in Country A/B and exporting to country B/A. The equation can be divided into two parts. The first part of the equation represents the after-tax profits obtained from locating in Country A/B and exporting to Country B/A. Meanwhile, the second part refers to the additional profits resulting from transfer pricing practices, which come into play when the tax rates in countries A/B and H differ.

Note that the sign of the tax differential ( $t_j - t_H$ ) doesn't affect the overall increase in global profits due to profit shifting. This implies that, regardless of whether the tax rates are higher in country A/B or country H, employing profit shifting strategies will consistently lead to an increase in global profits for the firm. This is because regardless of whether the host country has lower tax rates than the home country, the MNE will adjust its transfer pricing to shift profits to the jurisdiction with the more favourable tax conditions. This strategy is beneficial for the MNE as it minimises overall tax liabilities, resulting in higher global profits. The above refined profit functions will be used in the next section to compare location decisions in the three proposed scenarios.

### Comparing locations A & B

Three scenarios with varying degrees of enforcement levels, are considered below. In each scenario, the model assesses where the MNE would choose to locate and open its subsidiary. The key criterion for this determination is to identify the country that offers the highest level of after-tax profits, considering tax differentials, transport costs and enforcement measures. By systematically considering different enforcement levels, the model aims to provide comprehensive insights into the strategic choices MNEs make when navigating diverse regulatory contexts and insights on how changes in enforcement levels influence MNE location decisions and profit-shifting behaviours within the global economic landscape. The following scenarios are considered:

*Figure 6 - Scenarios Considered*



**Scenario 1:** No Profit Shifting Opportunities i.e.,  $t_A = t_B = t_H$

In the first scenario, the model considers a situation where there are no profit shifting opportunities which implies that the tax rate of the home country is equal to the tax rate of the two potential host countries. Given that Scenario 1 does not allow for any profit shifting opportunities, the second part of the profit functions (a.7) and (b.7) is removed. Hence the comparison is solely based on the first part of the profit function, which will always be greater for Country B since locating in the large country leads to higher profits. Consequently, the MNE exhibits a preference for locating in the larger country, primarily attributable to the advantageous impact of the home market effect. This is similar to Haufler and Wooton's 1999 model, as they do not model the parent MNE and do not allow for profit shifting.

*The full workings showing that  $\pi_A^* < \pi_B^*$ , can be found in the Appendix under Proof 2.*

**Scenario 2:** Profit Shifting Opportunities exist but are equal i.e.,  $t_A = t_B < t_H$

In this scenario the MNE faces similar profit-shifting prospects in both Country A and Country B. This equilibrium in profit-shifting opportunities raises intriguing questions about the determinants of the MNE's location choice and its strategy for allocating profits between these two jurisdictions. Factors such as enforcement levels, trade costs, and market sizes may play pivotal roles in influencing the MNE's decision-making process. Within this economic scenario three distinct cases are also considered to assess the particular impact of enforcement levels on MNE's location decisions under conditions of equal tax differentials. The cases are the following:

- Case A: Enforcement levels are equal between Country A and Country B
- Case B: Enforcement levels are higher in Country A
- Case C: Enforcement levels are higher in Country B

**Scenario 2 Case A: Same Enforcement Level**  $\gamma_A = \gamma_B$

In Case A, where both profit shifting opportunities and enforcement levels are equivalent, Country B emerges as the preferred location for the MNE. This is because Country B has a larger market when compared to Country A hence tipping the scales in favour of Country B. In this context, the MNE evaluates various factors, including market size, transport costs, and potential tax liabilities, to ascertain the optimal location that maximizes after-tax profits. The absence of disparities in profit-shifting opportunities and enforcement levels underscores

Country B's attractiveness, providing a noteworthy illustration of how economic variables influence the MNE's strategic decisions in choosing its location and profit allocation strategy. *The full workings showing that  $\pi_A^* < \pi_B^*$ , can be found in the Appendix under Proof 3.*

**Scenario 2 Case B: Enforcement levels are higher in Country A  $\gamma_A > \gamma_B$**

In Case B, I consider a scenario where profit shifting opportunities remain equal between Country A and Country B, but Country A enforces tax regulations at a higher level. Country A's imposition of higher enforcement creates an added disadvantage for Country A and so Country B emerges again as the victorious location for the MNE. The equilibrium in profit-shifting potential, coupled with the MNE's strategic consideration of enforcement disparities, ultimately tips the scale in favour of Country B because the MNE's ultimate objective is to maximise after-tax profits by minimising profit shifting costs.

*The full workings showing that  $\pi_A^* < \pi_B^*$ , can be found in the Appendix under Proof 4.*

**Scenario 2 Case C: Enforcement levels are higher in Country B  $\gamma_A < \gamma_B$**

In this case, profit shifting opportunities are equal, but enforcement levels are higher in Country B ( $\gamma_A < \gamma_B$ ). This introduces a critical dynamic for the MNE to consider when making its location decision. Despite tax rates being uniform across the two potential host countries, the profit-shifting effect stemming from reduced transfer pricing cost in the smaller country, due to more lenient tax regulations, can result in higher profits in Country A compared to the larger country. This implies that relaxed transfer pricing documentation regulations in a smaller country can play a crucial role in an MNE's decision regarding their location. It emphasises the significance of considering not only tax rates and enforcement levels but also transfer pricing cost when evaluating potential host countries.

Determining where the MNE would locate is more complicated in this case than in the other cases since location decision is subject to the MNE's location valuation. As a general note, the MNE will be indifferent between locating in Country A or Country B if the after-tax profits in both countries are equal ( $\pi_A^* = \pi_B^*$ ). The difference in enforcement levels, denoted as  $\Gamma \equiv \gamma_B - \gamma_A$ , represents the "enforcement premium" that the MNE is willing to pay for the advantages offered by Country B. The full workings to calculate this premium is included in the first section of the Appendix. While the algebraic interpretation of this point of indifference

is complex, this becomes clearer in the numerical simulation considered in Chapter 6 Section 6.2.2.

**Scenario 3:** Profit Shifting Opportunities exist but are unequal i.e.,  $t_H > t_B > t_A = 0$

This scenario represents an economic environment where profit shifting opportunities are unequal due to the tax disparities between the three countries. Specifically, the tax rate in the host country ( $t_H$ ) exceeds that of Country B ( $t_B$ ), which in turn is higher than the tax rate in Country A ( $t_A$ ), where it is set at zero. This disparity in tax rates sets the stage for varying profit shifting opportunities across the three jurisdictions. In this scenario, the MNE must navigate these differences strategically to determine the optimal location for profit allocation, taking into account factors such as market size, transport costs, and enforcement levels. This scenario offers valuable insights into how the MNE responds to differing tax environments and exploits profit shifting opportunities to maximise after-tax profits. The cases considered are the following:

- Case A: Enforcement levels are equal between Country A and Country B
- Case B: Enforcement levels are higher in Country A
- Case C: Enforcement levels are higher in Country B

**Scenario 3 Case A: Same Enforcement Level**  $\gamma_A = \gamma_B$

In this scenario, the profit shifting effect, due to Country A's lower tax rate, weakens the home market effect of Country B. In this case each country possesses its own distinct advantage. While Country A has a lower tax rate, providing an enticing tax environment for profit allocation, Country B has a larger market due to its size, offering significant market potential for the MNE. This dynamic introduces a compelling strategic dilemma for the MNE, as they must carefully weigh the benefits of lower tax liabilities against a larger market size and thus the MNE must carefully deliberate which advantage holds greater significance to them. While the MNE's location decision is subject to their own valuation the model concludes that the MNE locates in Country A since the profits generated in Country A surpass profits in Country B.

*The full workings showing that  $\pi_A^* > \pi_B^*$ , can be found in the Appendix under Proof 5.*

**Scenario 3 Case B: Enforcement levels are higher in Country A  $\gamma_A > \gamma_B$**

In this case Country B has two advantages i.e., large market size and lower enforcement whilst Country A has one advantage i.e., low tax rates. Once again, the determination of where the MNE will locate is not as straightforward and is subject to the MNE's valuation. Assuming that the MNE values low tax rates more than the large market size and low enforcement, the MNE would locate in Country A. However, if the MNE values the large market size and low enforcement more than the low tax rates, it will locate in Country B.

As a general note, the firm will only be indifferent between locating in Country A or Country B if the after-tax profits in both locations are equal ( $\pi_A^* = \pi_B^*$ ). Assuming that the MNE values large market size, Country B can impose a 'tax premium', denoted as  $\Gamma \equiv t_B - t_A$ , which represents how much Country A can increase its tax rate and leave the MNE indifferent. The full workings to calculate this premium is included in section 1 of the Appendix. While the algebraic interpretation of this point of indifference is complex, this becomes clearer in the numerical simulation considered in Chapter 6 Section 6.2.3.

**Scenario 3 Case C: Enforcement levels are higher in Country B  $\gamma_A < \gamma_B$**

Similar to Scenario 3 Case A, the profit shifting effect, due to Country A's lower tax rate and lower enforcement, weakens the home market effect of Country B. In this case Country A has two advantages i.e., low tax rate and low enforcement whilst Country B only has one advantage i.e., large market size. While the MNE's location decision is subject to their own valuation it is very much likely that the MNE will locate in Country A since the low tax rates and low enforcement ultimately tip the scale in favour of Country A given that the MNE's ultimate objective is to maximise profits by minimising profit shifting costs.

*The full workings showing that  $\pi_A^* > \pi_B^*$ , can be found in the Appendix under Proof 5.*

## **5.4 INSIGHTS DERIVED FROM THE GAME**

In the preceding section, I examine three distinct scenarios, each representing varying economic landscapes. These analyses yielded compelling insights. In the absence of profit shifting opportunities (Scenario 1) the model predicts that the MNE will locate in the large country due to the anticipated higher profits compared to the smaller country. However, this conclusion may change when profit shifting opportunities exist.

In the case where profit shifting opportunities exist and are equal, since both host countries offer the same tax rate (Scenario 2), the model predicts that in most cases (Case A and B) the MNE will locate in the large country due to the higher expected profits. However, in the case where the large country enforces stricter enforcement, the interplay between profit shifting effect and home market effect may render the smaller country a more profitable location.

The last scenario, Scenario 3, considers a situation where profit shifting opportunities exist but are unequal (Scenario 3), meaning varying tax rates between the small and large countries. Here the model predicts that in most cases (Case A and C) the MNE will find it more profitable to locate in the small country. However, in the case where the small country imposes more stringent enforcement, the profit shifting effect and home market effect may shift, rendering the large country more profitable.

## **6. DISCUSSION**

## **6.1 INTRODUCTION**

The discussion chapter provides a rigorous examination of the model's predictions and conclusions presented in the previous chapter. In this chapter, I embark on a series of simulations aimed at validating the predictions and conclusions of the model. These simulations are illustrated graphically, to provide a visual elucidation of the findings. By employing simulations, I aim to bolster the robustness of the theoretical framework and offer a more tangible grasp of the dynamics underlying the MNE's behaviour in the context of profit shifting and tax competition. Additionally, this chapter serves as the platform for a comprehensive discussion of the pivotal insights gleaned from the model.

## **6.2 SIMULATIONS**

In this section, I provide numerical examples to demonstrate how the model operates in different scenarios. By subjecting the model to numerical examples, I aim to demonstrate its robustness and effectiveness in capturing real-world scenarios. These simulations not only provide empirical grounding for the theoretical framework but also showcase its adaptability and utility across various economic contexts. Through this exercise, I bolster the credibility of the model, affirming its capacity to offer valuable insights.

In the course of the simulations, a number of defined assumptions are employed. These include the premise that the large country boasts a market size three times larger than that of the small country ( $N = 3$ ), coupled with a constant transport cost of  $\tau = 0.08$ . These two assumptions will serve as constants across all scenarios. However, it's worth noting that some scenarios introduce additional assumptions tailored to their unique context. Such assumptions will be explicitly outlined within the respective sections for clarity and transparency.

### **6.2.1 Scenario 1**

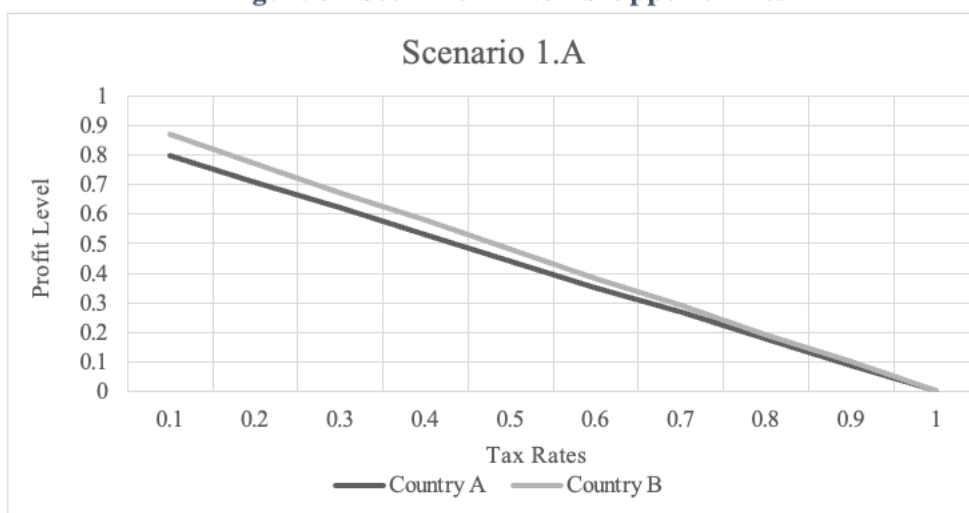
The first scenario illustrates a situation wherein profit shifting opportunities are not possible since the tax rates of the home country and the two prospective host countries are equal, as evident in Table 1. To evaluate the impact of varying tax rates on profit levels, different tax

rate levels are considered. The tabulated results, followed by their graphical representation, conclusively demonstrate that establishing a subsidiary in the large country consistently yields higher profits compared to if it locates in small country. This finding is further substantiated by algebraic Proof 2. Additionally, it is noteworthy that the MNE's profits decrease in tandem with rising tax rates, as depicted in Figure 7.

*Table 1 - Scenario 1 - No PS Opportunities*

$N$	$t_A$	$t_B$	$t_H$	$\tau$	$\gamma_A$	$\gamma_B$	$\pi_A^*$	$\pi_B^*$
3	0.1	0.1	0.1	0.08	1	1	0.80	<b>0.87</b>
3	0.2	0.2	0.2	0.08	1	1	0.71	<b>0.77</b>
3	0.3	0.3	0.3	0.08	1	1	0.62	<b>0.67</b>
3	0.4	0.4	0.4	0.08	1	1	0.53	<b>0.58</b>
3	0.5	0.5	0.5	0.08	1	1	0.44	<b>0.48</b>
3	0.6	0.6	0.6	0.08	1	1	0.35	<b>0.38</b>
3	0.7	0.7	0.7	0.08	1	1	0.27	<b>0.29</b>
3	0.8	0.8	0.8	0.08	1	1	0.18	<b>0.19</b>
3	0.9	0.9	0.9	0.08	1	1	0.09	<b>0.10</b>
3	1.0	1.0	1.0	0.08	1	1	0	<b>0</b>

**Figure 7 - Scenario 1 - No PS Opportunities**



### 6.2.2 Scenario 2

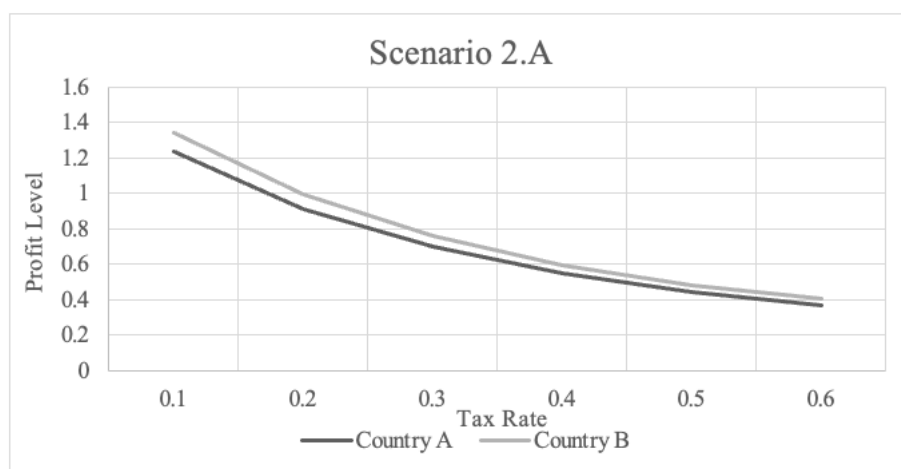
The second scenario allows for profit shifting opportunities, with both prospective host countries maintaining an equivalent tax rate, lower than that of the home country. Moreover, this scenario introduces variations in enforcement levels across the three cases.

In Case A of the second scenario, the enforcement levels in the two countries are equal. To evaluate the impact of varying tax rates on profit levels, different tax rate levels are considered. As predicted by the model, Table 2 conclusively demonstrates that the large country will emerge as the preferred location due to its consistently superior profits generation across various tax rates. This finding is further substantiated by algebraic Proof 3. Additionally, it is noteworthy that the MNE's profits decrease in tandem with rising tax rates, as depicted in Figure 8.

*Table 2 - Scenario 2 Case A - PS Opportunities exist but are equal*

N	$t_A$	$t_B$	$t_H$	$\tau$	$\gamma_A$	$\gamma_B$	$\pi_A^*$	$\pi_B^*$
3	0.1	0.1	0.5	0.08	1	1	1.24	<b>1.34</b>
3	0.2	0.2	0.5	0.08	1	1	0.91	<b>0.99</b>
3	0.3	0.3	0.5	0.08	1	1	0.70	<b>0.76</b>
3	0.4	0.4	0.5	0.08	1	1	0.55	<b>0.60</b>
3	0.5	0.5	0.5	0.08	1	1	0.44	<b>0.48</b>

*Figure 8 - Scenario 2 Case A - PS Opportunities exist but are equal*

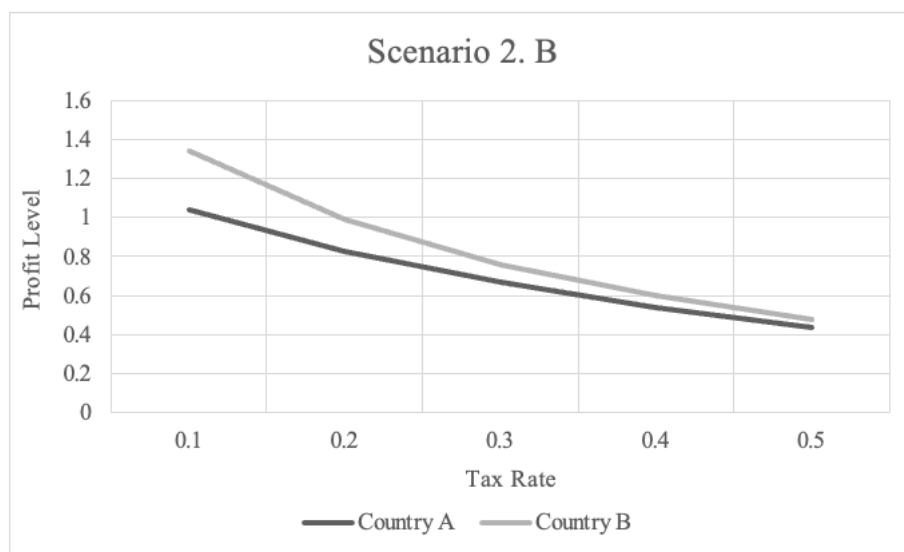


In Case B, enforcement levels are adjusted to incorporate more stringent enforcement measures in the small country ( $\gamma_A = 1.5$ ), compared to the large country ( $\gamma_B = 1$ ). Different levels of tax rates are taken into account to assess their impact on profit levels. As projected by the model, the large country emerged as the prevailing choice once more due to its capacity to yield greater profits compared to the small country. This conclusion has already been algebraically proven in Proof 4. Notably, Figure 9 illustrates that as tax rates approach that of the home country ( $t_H = 0.5$ ), the profit differential between the two countries diminishes. This underscores the disincentive for the MNE to establish its presence in either of the two countries when tax rates are close to the home country's tax rate.

*Table 3 - Scenario 2 Case B - PS Opportunities exist but are equal*

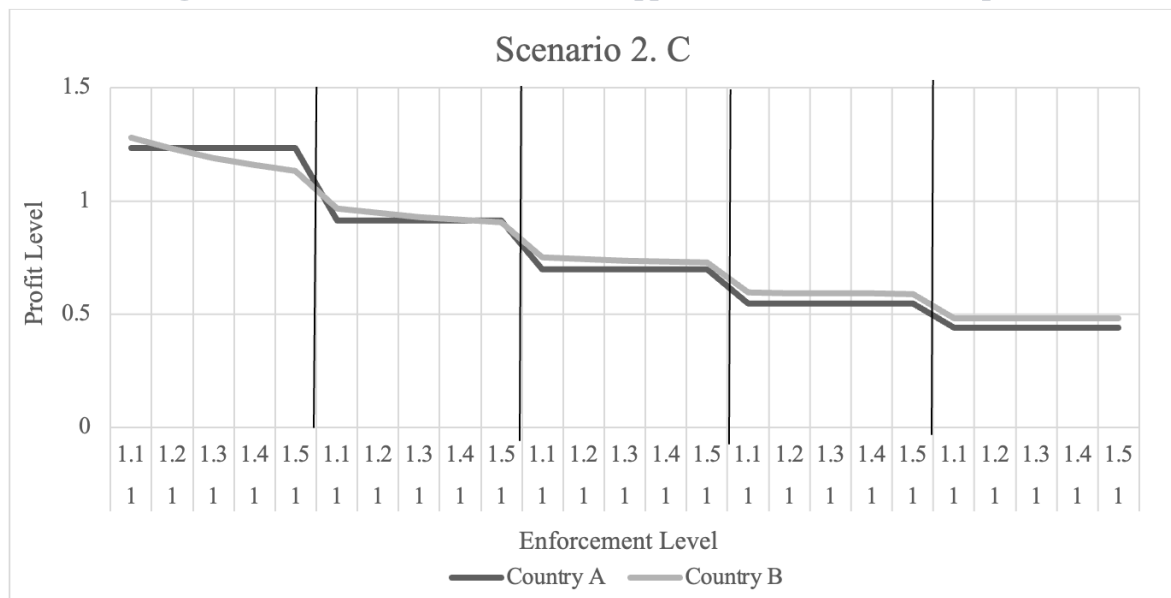
N	$t_A$	$t_B$	$t_H$	$\tau$	$\gamma_A$	$\gamma_B$	$\pi_A^*$	$\pi_B^*$
3	0.1	0.1	0.5	0.08	1.5	1	1.04	<b>1.34</b>
3	0.2	0.2	0.5	0.08	1.5	1	0.83	<b>0.99</b>
3	0.3	0.3	0.5	0.08	1.5	1	0.67	<b>0.76</b>
3	0.4	0.4	0.5	0.08	1.5	1	0.43	<b>0.60</b>
3	0.5	0.5	0.5	0.08	1.5	1	0.44	<b>0.48</b>

*Figure 9 - Scenario 2 Case B - PS Opportunities exist but are equal*



In the last case, Country B enforces stricter measures, resulting in higher costs associated with profit shifting compared to Country A. As already mentioned in the Model chapter determining where the MNE locates is not as straightforward. To get a clearer picture of what the MNE would do, different levels of tax rates and enforcement levels are taken into account to assess their impact on profit levels. As anticipated by the model and as demonstrated below, the profit shifting effect, arising from reduced transfer pricing costs in the smaller country due to less stringent regulations, can yield greater profits in Country A. As can be seen in the table below, with a common tax rate of 0.1, profits in Country B outweigh profits in Country A up to when enforcement is at level of 1.2. Subsequently, as enforcement surpasses this threshold, profits in Country A exceed those in Country B, leading the MNE to favour Country A as its preferred location. However, as tax rates increase this relationship no longer holds. This is because Country A's profit shifting advantage, due to lower enforcement, is diminished as tax rates increase. Hence at increasing tax rates the MNE would locate in the large country. Furthermore, Table 4 demonstrates that as tax rates in both countries approach the tax rate of the home country, profit levels decrease. This suggests that locating in either Country A or B becomes less advantageous as their tax rates align with that of the home country.

**Figure 10 - Scenario 2 Case C - PS Opportunities exist but are equal**



*Table 4 - Scenario 2 Case C - PS Opportunities exist but are equal*

N	$t_A$	$t_B$	$t_H$	$\tau$	$\gamma_A$	$\gamma_B$	$\pi_A^*$	$\pi_B^*$
3	0.1	0.1	0.5	0.08	1	1.1	1.24	<b>1.28</b>
3	0.1	0.1	0.5	0.08	1	1.2	<b>1.24</b>	1.23
3	0.1	0.1	0.5	0.08	1	1.3	<b>1.24</b>	1.19
3	0.1	0.1	0.5	0.08	1	1.4	<b>1.24</b>	1.16
3	0.1	0.1	0.5	0.08	1	1.5	<b>1.24</b>	1.13
3	0.2	0.2	0.5	0.08	1	1.1	0.91	<b>1.0</b>
3	0.2	0.2	0.5	0.08	1	1.2	0.91	<b>0.95</b>
3	0.2	0.2	0.5	0.08	1	1.3	0.91	<b>0.93</b>
3	0.2	0.2	0.5	0.08	1	1.4	0.91	<b>0.92</b>
3	0.2	0.2	0.5	0.08	1	1.5	<b>0.91</b>	0.90
3	0.3	0.3	0.5	0.08	1	1.1	0.70	<b>0.75</b>
3	0.3	0.3	0.5	0.08	1	1.2	0.70	<b>0.74</b>
3	0.3	0.3	0.5	0.08	1	1.3	0.70	<b>0.74</b>
3	0.3	0.3	0.5	0.08	1	1.4	0.70	<b>0.73</b>
3	0.3	0.3	0.5	0.08	1	1.5	0.70	<b>0.73</b>
3	0.4	0.4	0.5	0.08	1	1.1	0.55	<b>0.59</b>
3	0.4	0.4	0.5	0.08	1	1.2	0.55	<b>0.59</b>
3	0.4	0.4	0.5	0.08	1	1.3	0.55	<b>0.59</b>
3	0.4	0.4	0.5	0.08	1	1.4	0.55	<b>0.59</b>
3	0.4	0.4	0.5	0.08	1	1.5	0.55	<b>0.59</b>
3	0.5	0.5	0.5	0.08	1	1.1	0.44	<b>0.48</b>
3	0.5	0.5	0.5	0.08	1	1.2	0.44	<b>0.48</b>
3	0.5	0.5	0.5	0.08	1	1.3	0.44	<b>0.48</b>
3	0.5	0.5	0.5	0.08	1	1.4	0.44	<b>0.48</b>
3	0.5	0.5	0.5	0.08	1	1.5	0.44	<b>0.48</b>

### 6.2.3 Scenario 3

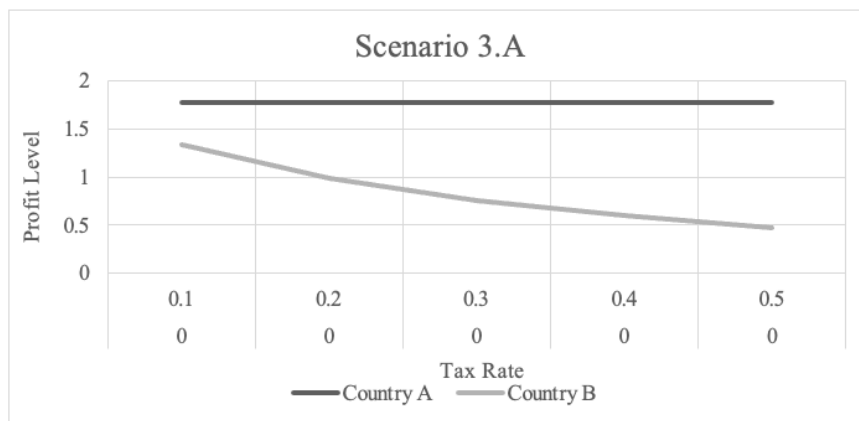
The third scenario allows for profit shifting opportunities to exist but with disparities in tax rates in the two potential host countries. To simplify matters, an assumption is made in this scenario that the smaller country's tax rate is set to zero. In line with the previous scenario, it is assumed that the home country's tax rate will remain the highest. Additionally, akin to the preceding scenario, enforcement levels are diversified across the three instances.

In Case A of the third scenario, both countries impose the same enforcement levels ( $\gamma_A = \gamma_B = 1$ ). To assess how different tax rates affect profit levels, the model considers various tax rate levels for the large country, while maintaining a constant tax rate of zero for the small country. As anticipated by the model, Table 5 conclusively demonstrates that the small country emerges as the preferred location, consistently yielding higher profits across different tax rates. This is because the profit shifting effect induced by a lower tax rate, weakens Country B's home market effect to an extent where profits in Country A surpass those in Country B. This finding is further substantiated by algebraic Proof 5. As can also be observed in Figure 11, Country B's profit levels continue to drop as its tax rate approaches that of the home country.

*Table 5 - Scenario 3 Case A - PS Opportunities exist but are unequal*

N	$t_A$	$t_B$	$t_H$	$\tau$	$\gamma_A$	$\gamma_B$	$\pi_A^*$	$\pi_B^*$
3	0	0.1	0.5	0.08	1	1	1.77	1.34
3	0	0.2	0.5	0.08	1	1	1.77	0.99
3	0	0.3	0.5	0.08	1	1	1.77	0.76
3	0	0.4	0.5	0.08	1	1	1.77	0.60
3	0	0.5	0.5	0.08	1	1	1.77	0.48

*Figure 11 - Scenario 3 Case A - PS Opportunities exist but are unequal*

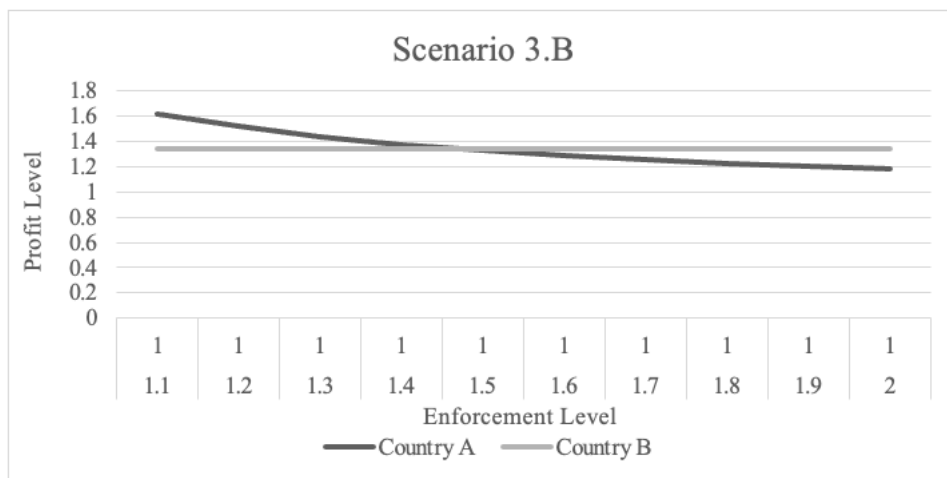


In the second case, Country A enforces more stringent measures, resulting in higher costs associated with profit shifting compared to Country B. As previously mentioned in the Model chapter determining where the MNE locates is not as straightforward in this case. To get a clearer picture of what the MNE would do, different levels of enforcement levels are considered to assess their impact on profit levels. As evident in the table provided, when the tax rate in Country A is set at 0 and 0.1 in Country B, profits in Country A outweigh profits in Country B up to when enforcement is at level of 1.4. However, once enforcement exceeds this threshold, it is no longer financially advantageous to establish operations in Country A, as Country B offers higher profits. This trend is also discernible in the visual representation.

**Table 6 - Scenario 3 Case B - PS Opportunities exist but are unequal**

N	$t_A$	$t_B$	$t_H$	$\tau$	$\gamma_A$	$\gamma_B$	$\pi_A^*$	$\pi_B^*$
3	0	0.1	0.5	0.08	1.1	1	<b>1.62</b>	1.34
3	0	0.1	0.5	0.08	1.2	1	<b>1.52</b>	1.34
3	0	0.1	0.5	0.08	1.3	1	<b>1.44</b>	1.34
3	0	0.1	0.5	0.08	1.4	1	<b>1.38</b>	1.34
3	0	0.1	0.5	0.08	1.5	1	1.33	<b>1.34</b>
3	0	0.1	0.5	0.08	1.6	1	1.29	<b>1.34</b>
3	0	0.1	0.5	0.08	1.7	1	1.25	<b>1.34</b>
3	0	0.1	0.5	0.08	1.8	1	1.22	<b>1.34</b>
3	0	0.1	0.5	0.08	1.9	1	1.20	<b>1.34</b>
3	0	0.1	0.5	0.08	2	1	1.18	<b>1.34</b>

**Figure 12 - Scenario 3 Case B - PS Opportunities exist but are unequal**

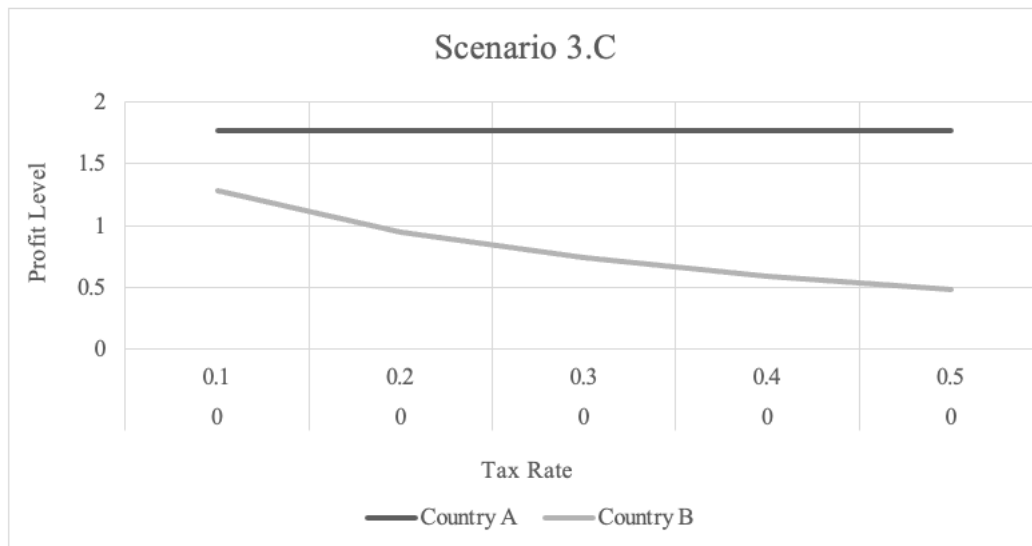


In the last case, the large country is assumed to have higher enforcement ( $\gamma_B = 1.5$ ) when compared to the small country ( $\gamma_A = 1$ ). To assess how different tax rates affect profit levels, the model considers various tax rate levels for the large country, while maintaining a constant tax rate of zero for the small country. Similar to the first case in the third scenario, the profit shifting effect induced by a lower tax, and in this case lower enforcement, weakens the home market effect to the point that Country A outweighs Country B in profits generated. This finding is further substantiated by algebraic Proof 6. As can also be observed in Figure 13, Country B's profit levels continue to drop as its tax rate approaches that of the home country.

**Table 7 - Scenario 3 Case C - PS Opportunities exist but are unequal**

N	$t_A$	$t_B$	$t_H$	$\tau$	$\gamma_A$	$\gamma_B$	$\pi_A^*$	$\pi_B^*$
3	0	0.1	0.5	0.08	1	1.5	1.77	1.13
3	0	0.2	0.5	0.08	1	1.5	1.77	0.90
3	0	0.3	0.5	0.08	1	1.5	1.77	0.73
3	0	0.4	0.5	0.08	1	1.5	1.77	0.59
3	0	0.5	0.5	0.08	1	1.5	1.77	0.48

**Figure 13 - Scenario 3 Case C - PS Opportunities exist but are unequal**



### 6.3 DISCUSSION OF RESULTS

The model, coupled with the subsequent simulations, yields a multitude of intriguing results with broad applicability across diverse contexts. In the forthcoming section, I discuss a selection of these findings, offering valuable insights into the dynamics of profit shifting, tax competition, and their implications for MNEs and host countries.

In the absence of profit shifting opportunities the MNE exhibits a consistent preference for setting up its plant in the large country, regardless of the prevailing tax rate and enforcement level. This inclination stems from the fact that profits derived in the large country consistently surpass profits in the small country. This also holds in a scenario where profit shifting opportunities exist and are equal, meaning that tax rates are the same for both potential host countries. These two findings underscore the powerful influence of the home market effect, which strongly favours countries with substantial market sizes. This also emphasises the critical role market size plays in the decision-making process of MNEs, highlighting the inherent advantage that countries with large markets hold in attracting and retaining FDI.

Despite the advantageous market size of Country B, the model demonstrates that under specific economic circumstances, the profit-shifting mechanism can counterbalance and even outweigh the advantage of a larger market. This underscores the intricate interplay between tax policies, market dynamics, and enforcement levels. This is evident in Scenario 3 which considers a situation of unequal profit shifting opportunities. In this specific context, the smaller country sets a tax rate of zero and hence offers better profit shifting opportunities than the large country does. As observed in two of the cases, when the small country offers lower tax rates and lower or equal enforcement levels, the MNE would locate in the small country rather than in large country. This finding challenges conventional assumptions about the inherent advantages of larger markets, emphasising that with the right policies in place, small countries can be formidable players in the global economic landscape. Moreover, this finding underscores the importance of considering the broader economic context when evaluating the attractiveness of a location for profit shifting.

The model also offers insights into how in an environment with equal level enforcement, governments will seek alternative means to attract FDI. As the model demonstrates in the case where profit shifting opportunities exist and are equal and enforcement levels are also equal,

the MNE would locate in the large country. However, in the case where profit shifting opportunities exist but are not equal, the MNE's location decision is not as straightforward and depends on the MNE's subjective valuation. This particular finding highlights the need for countries to adopt a multifaceted approach in crafting tax policies and that countries should not rely solely on enforcement measures (or in the opposite scenario, enforcement leniency) but should also strategically utilise tax incentives and market attributes to remain competitive in the global economic landscape.

The model also offers interesting insights for international governments seeking to address harmful tax competition and combat aggressive profit shifting. Both countries in the model had two tools at their disposal to attract the MNE namely the adjustment of the tax rate and enforcement levels. While more stringent enforcement (represented by a high  $\gamma$  value) served as a sufficient deterrent against aggressive profit-shifting strategies, as variations in enforcement levels tipped the scales in favour of one location over another, the tax rate emerged as an event more potent tool in curbing profit shifting. This underscores that aligning corporate tax rates across countries could potentially serve as a more effective policy approach than implementing stricter enforcement measures in mitigating harmful tax competition.

#### **6.4 MODEL LIMITATIONS**

Despite the model's robustness in capturing key dynamics of profit shifting and tax competition, it is important to acknowledge its inherent limitations. These limitations, while not undermining the model's overall utility, provide avenues for future refinement. One such limitation arises from the assumption of a fixed home tax rate, which simplifies the complex interplay between profit shifting strategies and the tax policies of the parent company's location. In reality, these dynamics are likely to be more dynamic and reciprocal as the home country strategically and continuously adjusts its tax rate to remain competitive.

Another simplification made in the model is that enforcement and tax rates were exogenously determined. While this provides a simplified framework, it may overlook the reciprocal relationship between profit shifting behaviours and tax policy decisions, potentially leading to

an incomplete representation of real-world dynamics. Additionally, this approach assumes a static environment, failing to account for how tax policies may adapt in response to profit shifting strategies and competing country's tax policies. As a result, the exogenous treatment may not fully capture the dynamic nature of international tax competition and profit shifting.

Another assumption inherent in the model is the premise that the small country exhibits a greater degree of tax leniency compared to the larger country. However, it's important to note that this assumption, while providing a useful starting point for analysis, may not always align with real-world scenarios. The level of tax leniency between small and large countries can vary considerably, introducing a potential limitation in the model's applicability.

## **7. CONCLUSION**

## **7.1 INTRODUCTION**

The conclusion chapter provides practical takeaways from the study. In the upcoming sections I distil the policy implications drawn from the model's results, providing actionable insights for policymakers navigating the complexities of MNEs. Additionally, I identify possible research avenues for further exploration, highlighting areas where deeper exploration can yield even greater understanding. Finally, I offer my concluding remarks to encapsulate the significance of my findings within the broader context of international economics and emphasise their relevance in an increasingly interconnected global economy.

## **7.2 POLICY RELEVANCE AND IMPLICATIONS**

The findings of this study carry significant implications for policy formulation in the realm of international taxation. By delving into the dynamics of profit shifting, tax competition, and their impact on MNEs, my research offers valuable insights for policymakers in designing tax policies.

One of the main findings from the model is that effective enforcement mechanisms and strategic adjustment of tax rates can act as strong deterrents to profit shifting as they increase costs for MNEs. Hence governments keen on deterring profit shifting may opt to implement stringent and robust regulatory frameworks or increase their tax rates. These regulations can encompass a spectrum of measures, including comprehensive transfer pricing rules, enhanced disclosure requirements, and stricter enforcement mechanisms. Additionally, governments may collaborate with international bodies to harmonise and align their corporate tax rates to eliminate profit shifting opportunities. This particular finding can help inform the design of tax policies to strike a balance between attracting foreign investment and safeguarding a fair distribution of tax revenues.

Additionally, the model reveals that with the right economic conditions, small countries possess the potential to successfully attract MNEs to locate in their jurisdiction. This finding has significant policy implications as it underscores the potential for small economies to compete effectively in the global market. Policymakers in small countries can leverage this insight by focusing on creating a favourable economic environment that is conducive to foreign

investment. This may involve implementing targeted tax incentives, streamlining regulatory processes, and investing in infrastructure and human capital development. Such policies can position small countries as viable destinations for MNEs, fostering economic growth and job creation. Overall, this study contributes to the ongoing discourse on international tax policy, offering practical considerations for policymakers seeking to foster a conducive environment for economic growth and stability.

### **7.3 AVENUES FOR FURTHER RESEARCH**

While this study has made significant strides in understanding the dynamics of profit shifting, tax competition, and their implications, there remain several promising avenues for further research. Firstly, delving into the endogenous determination of tax rates and enforcement within the model could yield deeper insights into how policy variables interact and influence strategic decisions of MNEs. Additionally, investigating the intricate relationship between tax rates and enforcement measures, and how changes in one variable can impact the other, could shed light on the complex interplay between regulatory elements. Furthermore, another area of exploration would be to look into how a small and large country value FDI respectively, looking at the components countries take on board when valuing foreign investment for example knowledge spill over, technology diffusion and bolstering overall economic competitiveness. Understanding how these valuation disparities influence competition for FDI could provide valuable policy insights.

## **7.4 CONCLUDING REMARKS**

In conclusion, this study has delved into the intricate dynamics of profit shifting, tax competition, and the strategic decisions of MNEs within the global economic landscape. By developing an applied theoretical model and conducting numerical simulations, I have unearthed valuable insights that shed light on the motivations, mechanisms, and consequences of profit shifting strategies. Additionally, I have explored how tax rates, enforcement levels, market size, and MNE valuations shape competition between countries of varying sizes. These findings hold significant implications for policymakers, offering guidance on crafting effective tax policies and regulatory frameworks that balance the interests of attracting FDI with safeguarding tax revenues. Furthermore, this research underscores the potential for small countries to compete successfully in the global market under the right economic conditions. As I conclude this study, it is evident that the complexities of profit shifting and tax competition continue to be essential topics in the realm of international economics, leaving room for further exploration and policy refinement in the years to come.

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## **9. APPENDIX**

## 9.1 APPENDIX A – FULL WORKINGS

### Stage 2: MNE determines transfer price of intermediate input

Maximising (a.2) with respect to  $Q_A^A$ ,  $Q_B^A$  and  $\delta_A$  solves for the values that maximise profits.

$$\pi_A^* = (1 - t_A) \left[ (1 - Q_A^A) Q_A^A + \left( 1 - \frac{1}{N} Q_B^A - \tau \right) Q_B^A \right] + (\delta_A)(t_A - t_H)[Q_A^A + Q_B^A] - \frac{1}{2} \gamma_A \delta_A^2 - F$$

... (a.2)

$$\frac{d\pi_A^*}{dQ_A^A} = (1 - t_A) - 2(1 - t_A)Q_A^A + \delta_A(t_A - t_H) = 0$$

$$(1 - t_A) + \delta_A(t_A - t_H) = 2(1 - t_A)Q_A^A$$

$$Q_A^A = \frac{(1-t_A)+\delta_A(t_A-t_H)}{2(1-t_A)} \dots \text{(a.3)}$$

$$\frac{d\pi_A^*}{dQ_B^A} = (1 - t_A) - \frac{2(1 - t_A)Q_B^A}{N} - (1 - t_A)(\tau) + \delta_A(t_A - t_H) = 0$$

$$(1 - t_A) - (1 - t_A)(\tau) + \delta_A(t_A - t_H) = 2\left(\frac{1}{N}\right)(1 - t_A)Q_B^A$$

$$Q_B^A = \frac{N[(1 - t_A) - (1 - t_A)(\tau) + \delta_A(t_A - t_H)]}{2(1 - t_A)}$$

$$Q_B^A = \frac{N[(1-t_A)(1-\tau)+\delta_A(t_A-t_H)]}{2(1-t_A)} \dots \text{(a.4)}$$

$$\frac{d\pi_A^*}{d\delta_A} = (t_A - t_H)(Q_A^A + Q_B^A) - \frac{1}{2}(2)\gamma_A\delta_A = 0$$

$$\delta_A = \frac{(t_A-t_H)(Q_A^A+Q_B^A)}{\gamma_A} \dots \text{(a.5)}$$

Maximising (b.2) with respect to  $Q_A^A, Q_B^A$  and  $\delta_A$  solves for the values that maximise profits.

$$\pi_B^* = (1 - t_B) \left[ (1 - Q_A^B - \tau) Q_A^B + \left( 1 - \frac{1}{N} Q_B^B \right) Q_B^B \right] + (\delta_B)(t_B - t_H)[Q_A^B + Q_B^B] - \frac{1}{2} \gamma_B \delta_B^2 - F$$

... (b.2)

$$\frac{d\pi_B^*}{dQ_A^B} = (1 - t_B) - 2(1 - t_B)Q_A^B - \tau(1 - t_B) + \delta_B(t_B - t_H) = 0$$

$$(1 - t_B) - \tau(1 - t_B) + \delta_B(t_B - t_H) = 2(1 - t_B)Q_A^B$$

$$Q_A^B = \frac{(1-t_B)-\tau(1-t_B)+\delta_B(t_B-t_H)}{2(1-t_B)} \dots \text{(b.3)}$$

$$\frac{d\pi_B^*}{dQ_B^B} = (1 - t_B) - \frac{2(1 - t_B)Q_B^B}{N} + \delta_B(t_B - t_H) = 0$$

$$(1 - t_B) + \delta_B(t_B - t_H) = 2\left(\frac{1}{N}\right)(1 - t_B)Q_B^B$$

$$Q_B^B = \frac{N[(1-t_B)+\delta_B(t_B-t_H)]}{2(1-t_B)}$$

$$Q_B^B = \frac{N[(1-t_B)+\delta_B(t_B-t_H)]}{2(1-t_B)} \dots \text{(b.4)}$$

$$\frac{d\pi_B^*}{d\delta_B} = (t_B - t_H)(Q_A^B + Q_B^B) - \frac{1}{2}(2)\gamma_B\delta_B = 0$$

$$\delta_B = \frac{(t_B-t_H)(Q_A^B+Q_B^B)}{\gamma_B} \dots \text{(b.5)}$$

### Stage 1 – MNE decides where to locate

Substituting the optimal quantities to be produced, given by (a.4) and (a.5), into the optimal transfer price (a.6) gives the following:

$$\delta_A = \frac{(1-t_A)(t_A-t_H)(1+N(1-\tau))}{2\gamma_A(1-t_A)-(N+1)(t_A-t_H)^2} \dots \text{ (a.6)}$$

Similarly, substituting the optimal quantities to be produced, given by (b.4) and (b.5), into the optimal transfer price (b.6) gives the following:

$$\delta_B = \frac{(1-t_B)(t_B-t_H)(N+1-\tau)}{2\gamma_B(1-t_B)-(N+1)(t_B-t_H)^2} \dots \text{ (b.6)}$$

For the purpose of determining optimal profits to be shifted if MNE locates in Country A, expression (a.3) and (a.4) are rewritten as follows:

$$\text{(a.3): } Q_A^A = \frac{(1-t_A)+\delta_A(t_A-t_H)}{2(1-t_A)}$$

$$1 - Q_A^A = \frac{(1-t_A)-\delta_A(t_A-t_H)}{2(1-t_A)}$$

$$(1 - Q_A^A)Q_A^A = \frac{(1-t_A)^2 - \delta_A^2(t_A-t_H)^2}{4(1-t_A)^2}$$

$$\text{(a.4): } Q_B^A = \frac{N[(1-t_A)(1-\tau)+\delta_A(t_A-t_H)]}{2(1-t_A)}$$

$$1 - \frac{1}{N}Q_B^A - \tau = \frac{(1-t_A)(1-\tau)-\delta_A(t_A-t_H)}{2(1-t_A)}$$

$$(1 - \frac{1}{N}Q_B^A - \tau)Q_B^A = \frac{N[(1-t_A)^2(1-\tau)^2 - \delta_A^2(t_A-t_H)^2]}{4(1-t_A)^2}$$

These are then inputted in the original profit function, given by (a.2) to determine optimal profits to be shifted:

$$\pi_A^* = \frac{(1-t_A)}{4} \left[ 1 + N(1-\tau)^2 + \frac{(t_A-t_H)^2(1+N(1-\tau))^2}{2\gamma_A(1-t_A)-(N+1)(t_A-t_H)^2} \right] \dots \text{ (a.7)}$$

Similarly, for the purpose of determining optimal profits to be shifted if MNE locates in Country B, expression (b.3) and (b.4) are rewritten as follows:

$$(b.3): Q_A^B = \frac{(1-t_B)-\tau(1-t_B)+\delta_B(t_B-t_H)}{2(1-t_B)}$$

$$1 - Q_A^B - \tau = \frac{(1-t_B)(1-\tau)-\delta_B(t_B-t_H)}{2(1-t_B)}$$

$$(1 - Q_A^B - \tau)Q_A^B = \frac{(1-t_B)^2(1-\tau)^2 - \delta_B^2(t_B-t_H)^2}{4(1-t_B)^2}$$

$$(b.4): Q_B^B = \frac{N[(1-t_B)+\delta_B(t_B-t_H)]}{2(1-t_B)}$$

$$1 - \frac{1}{N}Q_B^B = \frac{(1-t_B)-\delta_B(t_B-t_H)}{2(1-t_B)}$$

$$(1 - \frac{1}{N}Q_B^B)Q_B^B = \frac{N[(1-t_B)^2 - \delta_B^2(t_B-t_H)^2]}{4(1-t_B)^2}$$

These are then inputted in the original profit function, given by (b.2) to determine optimal profits to be shifted:

$$\pi_B^* = \frac{(1-t_B)}{4} \left[ N + (1-\tau)^2 + \frac{(t_B-t_H)^2(N+1-\tau)^2}{2\gamma_B(1-t_B)-(N+1)(t_B-t_H)^2} \right] \dots (b.7)$$

**Scenario 2 Case C: Enforcement levels are higher in Country B**  $\gamma_A < \gamma_B$

To calculate this premium, a series of steps must be followed, enabling us to understand the extent to which the MNE values the higher enforcement levels in Country B as compared to Country A. This case sheds light on how enforcement dynamics play a crucial role in influencing the MNE's strategic location decisions.

Step 1: Make  $\gamma_A$  and  $\gamma_B$  subject of the formula

$$\begin{aligned}\pi_A^* &= \frac{(1-t_A)}{4} \left[ 1 + N(1-\tau)^2 + \frac{(t_A-t_H)^2(1+N(1-\tau))^2}{2\gamma_A(1-t_A) - (N+1)(t_A-t_H)^2} \right] \\ &\quad - \left[ \frac{(t_A-t_H)^2(1+N(1-\tau))^2}{2\gamma_A(1-t_A) - (N+1)(t_A-t_H)^2} \right] = 1 + N(1-\tau)^2 \\ \frac{-(t_A-t_H)^2(1+N(1-\tau))^2}{-(N+1)(t_A-t_H)^2} &= [1 + N(1-\tau)^2][2\gamma_A(1-t_A)] \\ \frac{1 + N(1-\tau)^2}{[2(1-t_A)][1 + N(1-\tau)^2][(N+1)]} &= \gamma_A\end{aligned}$$

$$\begin{aligned}\pi_B^* &= \frac{(1-t_B)}{4} \left[ N + (1-\tau)^2 + \frac{(t_B-t_H)^2(N+1-\tau)^2}{2\gamma_B(1-t_B) - (N+1)(t_B-t_H)^2} \right] \\ &\quad - \frac{(t_B-t_H)^2(N+1-\tau)^2}{2\gamma_B(1-t_B) - (N+1)(t_B-t_H)^2} = N + (1-\tau)^2 \\ \frac{-(t_B-t_H)^2(N+1-\tau)^2}{-(N+1)(t_B-t_H)^2} &= [2\gamma_B(1-t_B)][N + (1-\tau)^2] \\ \frac{(N+1-\tau)^2}{[2(1-t_B)][N + (1-\tau)^2](N+1)} &= \gamma_B\end{aligned}$$

Step 2: Expand and simply equation  $\Gamma \equiv \gamma_B - \gamma_A$

$$\Gamma \equiv \gamma_B - \gamma_A$$

$$\Gamma = \frac{(N+1-\tau)^2}{[2(1-t_B)][N+(1-\tau)^2](N+1)} - \frac{1+N(1-\tau)^2}{[2(1-t_A)][1+N(1-\tau)^2](N+1)}$$

Given that  $t_A = t_B$  and eliminating common term  $(N + 1)$ :

$$\Gamma = \frac{(N+1-\tau)^2}{[N+(1-\tau)^2]} - \frac{1+N(1-\tau)^2}{[1+N(1-\tau)^2]}$$

$$\Gamma = \underbrace{[(N + 1 - \tau)^2][1 + N(1 - \tau)^2]}_A - \underbrace{[1 + N(1 - \tau)^2][N + (1 - \tau)^2]}_B$$

Part A of equation:

$$\begin{aligned} & [N^2 + 2N - 2N\tau - 2\tau + \tau^2 + 1][1 + N - 2N\tau + N\tau^2] \\ & [N^2 + N^3 - 2N^3\tau + N^3\tau^2 + 2N + 2N^2 - 4N^2\tau + 2N^2\tau^2 - 2N\tau - 2N^2\tau + 4N^2\tau^2 - 2N^2\tau^3 - 2\tau \\ & \quad - 2N\tau + 4N\tau^2 - 2N\tau^3 + 1 + N - 2N\tau + N\tau^2 + \tau^2 + N\tau^2 - 2N\tau^3 + N\tau^4 \\ & \quad = \\ & 3N^2 + N^3 - 2N^3\tau + N^3\tau^2 + 3N - 6N^2\tau + 6N^2\tau^2 - 6N\tau - 2N^2\tau^3 - 2\tau + 6N\tau^2 - 4N\tau^3 + 1 \\ & \quad + \tau^2 + N\tau^4 \end{aligned}$$

Part B of equation:

$$\begin{aligned} & [N^2 + 2N - 2N\tau - 2N^2\tau - N^2\tau^2 + 1][N + 1 - 2\tau + \tau^2] \\ & N + 1 - 2\tau + \tau^2 + 2N^2 + 2N - 4N\tau + 2N\tau^2 - 2N^2\tau - 2N\tau + 4N\tau^2 - 2N\tau^3 + N^3 + N^2 - 2N^2\tau \\ & \quad + N^2\tau^2 - 2N^3\tau - 2N^2\tau + 4N^2\tau^2 - 2N^2\tau^3 + N^3\tau^2 + N^2\tau^2 - 2N^2\tau^3 + N^2\tau^4 \\ & \quad = \\ & 3N + 1 - 2\tau + \tau^2 + 3N^2 - 6N\tau + 6N\tau^2 - 6N^2\tau - 2N\tau^3 + N^3 + 6N^2\tau^2 - 2N^3\tau - 4N^2\tau^3 \\ & \quad + N^3\tau^2 + N^2\tau^4 \end{aligned}$$

A - B

$$\begin{aligned} & 3N^2 + N^3 - 2N^3\tau + N^3\tau^2 + 3N - 6N^2\tau + 6N^2\tau^2 - 6N\tau - 2N^2\tau^3 - 2\tau + 6N\tau^2 - 4N\tau^3 + 1 \\ & \quad + \tau^2 + N\tau^4 \end{aligned}$$

-

$$\begin{aligned} & 3N + 1 - 2\tau + \tau^2 + 3N^2 - 6N\tau + 6N\tau^2 - 6N^2\tau - 2N\tau^3 + N^3 + 6N^2\tau^2 - 2N^3\tau - 4N^2\tau^3 \\ & \quad + N^3\tau^2 + N^2\tau^4 \end{aligned}$$

=

$$2N^2\tau^3 - 2N\tau^3 + N\tau^4 + N^2\tau^4 \quad \square$$

**Scenario 3 Case B: Enforcement levels are higher in Country A  $\gamma_A > \gamma_B$**

To calculate this premium, a series of steps must be followed, enabling us to understand the extent to which the MNE values the higher enforcement levels in Country A as compared to Country B. This case sheds light on how enforcement dynamics play a crucial role in influencing the MNE's strategic location decisions.

Step 1: Make  $t_A$  and  $t_B$  subject of the formula.

$$\begin{aligned}\pi_A^* &= \frac{(1-t_A)}{4} \left[ 1 + N(1-\tau)^2 + \frac{(t_A-t_H)^2(1+N(1-\tau))^2}{2\gamma_A(1-t_A) - (N+1)(t_A-t_H)^2} \right] \\ &\quad - \left[ \frac{(t_A-t_H)^2(1+N(1-\tau))^2}{(1-t_A) - (N+1)(t_A-t_H)^2} \right] = 1 + N(1-\tau)^2 \\ (1+N(1-\tau))^2 &= \frac{[1+N(1-\tau)^2][(1-t_A) - (t_A-t_H)^2]}{-(t_A-t_H)^2} \\ t_A &= \frac{1 - 1 + N(1-\tau)^2}{(1+N(1-\tau))^2}\end{aligned}$$

$$\begin{aligned}\pi_B^* &= \frac{(1-t_B)}{4} \left[ N + (1-\tau)^2 + \frac{(t_B-t_H)^2(N+1-\tau)^2}{2\gamma_B(1-t_B) - (N+1)(t_B-t_H)^2} \right] \\ &\quad - \frac{(t_B-t_H)^2(N+1-\tau)^2}{(1-t_B) - (t_B-t_H)^2} = N + (1-\tau)^2 \\ (N+1-\tau)^2 &= \frac{[N+(1-\tau)^2][(1-t_B) - (t_B-t_H)^2]}{-(t_B-t_H)^2} \\ t_B &= \frac{1 - N + (1-\tau)^2}{(N+1-\tau)^2}\end{aligned}$$

Step 2: Expand and simply equation  $\Gamma \equiv t_B - t_A$

$$\Gamma \equiv \frac{1 + N(1 - \tau)^2}{[1 + N(1 - \tau)^2]} - \frac{(N + 1 - \tau)^2}{[(1 - t_B)][N + (1 - \tau)^2]}$$

$$\Gamma \equiv \frac{1 + N(1 - \tau)^2}{\text{-----A-----}} - \frac{(N + 1 - \tau)^2}{\text{-----B-----}}$$

Part A of equation:

$$\begin{aligned} & [1 + 2N - 2N\tau + N^2 - 2N^2\tau + N^2\tau^2][N + 1 - 2\tau + \tau^2 - Nt_B - t_B + 2\tau t_B - \tau^2 t_B] \\ & N + 1 - 2\tau + \tau^2 - Nt_B - t_B + 2\tau t_B - \tau^2 t_B + 2N^2 + 2N - 4N\tau + 2N\tau^2 - 2N^2 t_B - 2Nt_B \\ & + 4N\tau t_B - 2N\tau^2 t_B - 2N^2\tau - 2N\tau + 4N\tau^2 - 2N\tau^3 + 4N^2\tau t_B + 2N\tau t_B \\ & - 4N\tau^2 t_B + 2N\tau^3 t_B + N^3 + N^2 - 2N^2\tau + N^2\tau^2 - N^3 t_B - N^2 t_B + 2N^2\tau t_B \\ & - N^2\tau^2 t_B - 2N^3\tau - 2N^2\tau + 4N^2\tau^2 - 2N^2\tau^3 + 2N^3\tau t_B + 2N^2\tau t_B \\ & - 4N^2\tau^2 t_B + 2N^2\tau^3 t_B + N^3\tau^2 + N^2\tau^2 - 2N^2\tau^3 + N^2\tau^4 - N^3\tau^2 t_B \\ & - N^2\tau^2 t_B + 2N^2\tau^3 t_B - N^2\tau^4 t_B \\ & = \\ & 3N + 1 - 2\tau + \tau^2 - 3Nt_B - t_B + 2\tau t_B - \tau^2 t_B + 3N^2 - 6N\tau + 6N\tau^2 - 3N^2 t_B + 6N\tau t_B \\ & - 6N\tau^2 t_B - 6N^2\tau - 2N\tau^3 + 6N^2\tau t_B - 6N^2\tau^2 t_B - 2N^3\tau + 6N^2\tau^2 \\ & - 3N^2\tau^3 + 2N^3\tau t_B - 4N^2\tau^3 t_B + N^2\tau^4 - N^3\tau^2 t_B - 2N^3\tau - N^2\tau^4 t_B + N^3 \\ & + N^3\tau^2 \end{aligned}$$

Part B of equation:

$$\begin{aligned} & [N^2 + 2N - 2N\tau - 2\tau + \tau^2 + 1][1 + N - 2N\tau + N\tau^2] \\ & [N^2 + N^3 - 2N^3\tau + N^3\tau^2 + 2N + 2N^2 - 4N^2\tau + 2N^2\tau^2 - 2N\tau - 2N^2\tau + 4N^2\tau^2 - 2N^2\tau^3 - 2\tau \\ & - 2N\tau + 4N\tau^2 - 2N\tau^3 + 1 + N - 2N\tau + N\tau^2 + \tau^2 + N\tau^2 - 2N\tau^3 + N\tau^4 \\ & = \\ & 3N^2 + N^3 - 2N^3\tau + N^3\tau^2 + 3N - 6N^2\tau + 6N^2\tau^2 - 6N\tau - 2N^2\tau^3 - 2\tau + 6N\tau^2 - 4N\tau^3 + 1 \\ & + \tau^2 + N\tau^4 \end{aligned}$$

A - B

$$\begin{aligned} & 3N + 1 - 2\tau + \tau^2 - 3Nt_B - t_B + 2\tau t_B - \tau^2 t_B + 3N^2 - 6N\tau + 6N\tau^2 - 3N^2 t_B + 6N\tau t_B \\ & \quad - 6N\tau^2 t_B - 6N^2\tau - 2N\tau^3 + 6N^2\tau t_B - 6N^2\tau^2 t_B - 2N^3\tau + 6N^2\tau^2 \\ & \quad - 3N^2\tau^3 + 2N^3\tau t_B - 4N^2\tau^3 t_B + N^2\tau^4 - N^3\tau^2 t_B - 2N^3\tau - N^2\tau^4 t_B + N^3 \\ & \quad + N^3\tau^2 \end{aligned}$$

-

$$\begin{aligned} & 3N^2 + N^3 - 2N^3\tau + N^3\tau^2 + 3N - 6N^2\tau + 6N^2\tau^2 - 6N\tau - 2N^2\tau^3 - 2\tau + 6N\tau^2 - 4N\tau^3 + 1 \\ & \quad + \tau^2 + N\tau^4 \end{aligned}$$

=

$$\begin{aligned} & -3Nt_B - t_B + 2\tau t_B - \tau^2 t_B - 3N^2 t_B + 6N\tau t_B - 6N\tau^2 t_B + 2N\tau^3 + 6N^2\tau t_B - 6N^2\tau^2 t_B - \\ & \quad N^2\tau^3 + 2N^3\tau t_B - 4N^2\tau^3 t_B + N^2\tau^4 - N^3\tau^2 t_B - 2N^3\tau - N^2\tau^4 t_B - N\tau^4 \quad \square \end{aligned}$$

## 9.2 APPENDIX B – PROOFS

**Proof 1:** Country B would have a more aggressive transfer pricing strategy and would have hence have a lower value of  $\delta$ .

$$\delta_A > \delta_B$$

$$\frac{(1 - t_A)(t_A - t_H)(1 + N(1 - \tau))}{2\gamma_A(1 - t_A) - (N + 1)(t_A - t_H)^2} > \frac{(1 - t_B)(t_B - t_H)(N + 1 - \tau)}{2\gamma_B(1 - t_B) - (N + 1)(t_B - t_H)^2}$$

Eliminating common terms to focus on varying differences:

$$(1 + N(1 - \tau)) > (N + 1 - \tau)$$

$$N(1 - \tau) - N > 1 - \tau - 1$$

$$N(1 - \tau - 1) > -\tau$$

$$N > \tau \quad \square$$

**Proof 2:** Scenario 1- Profit Shifting Opportunities do not exist.

From profit function (a.7) and (b.7) it can be shown that  $\pi_A^* - \pi_B^* < 0$ :

$$\pi_A^* < \pi_B^*$$

$$1 + N(1 - \tau)^2 < N + (1 - \tau)^2$$

$$1 + N(1 - \tau)(1 - \tau) < N + (1 - \tau)(1 - \tau)$$

$$1 + N - 2N\tau + N\tau^2 < N + 1 - 2\tau + \tau^2$$

$$2\tau - \tau^2 < 2N\tau - N\tau^2$$

$$\tau(2 - \tau) < \tau(2N - N\tau)$$

$$2 - \tau < N(2 - \tau) \quad \square$$

**Proof 3:** Scenario 2 Case A – Profit Shifting Opportunities Exist & Equal – ( $\gamma_A = \gamma_B$ )

From profit function (a.7) and (b.7) it can be shown that  $\pi_A^* - \pi_B^* < 0$ :

$$\begin{aligned} \pi_A^* &< \pi_B^* \\ (1 + N(1 - \tau))^2 &< (N + 1 - \tau)^2 \\ (1 + N - N\tau)(1 + N - N\tau) &< (N + 1 - \tau)(N + 1 - \tau) \\ 1 + 2N - 2N\tau + N^2 - 2N^2\tau + N^2\tau^2 &< N^2 + 2N - 2N\tau + 1 - 2\tau + \tau^2 \\ -2N^2\tau + N^2\tau^2 &< -2\tau + \tau^2 \\ \tau(-2N^2 + N^2\tau) &< \tau(-2 + \tau) \\ 2 - 2N^2 &< \tau - N^2\tau \\ 2(1 - N^2) &< \tau(1 - N^2) \\ (1 - N^2) &< \frac{\tau}{2}(1 - N^2) \square \end{aligned}$$

**Proof 4:** Scenario 2 Case B – Profit Shifting Opportunities Exist & Equal – ( $\gamma_A > \gamma_B$ )

From profit function (a.7) and (b.7) it can be shown that  $\pi_A^* - \pi_B^* < 0$ :

$$\begin{aligned} \pi_A^* &< \pi_B^* \\ \frac{(1 + N(1 - \tau))^2}{2\gamma_A} &< \frac{(N + 1 - \tau)^2}{2\gamma_B} \\ \frac{-2N^2\tau + N^2\tau^2}{2\gamma_A} &< \frac{-2\tau + \tau^2}{2\gamma_B} \\ \frac{\tau(-2N^2 + N^2\tau)}{2\gamma_A} &< \frac{\tau(-2 + \tau)}{2\gamma_B} \\ 2\gamma_B(-2N^2 + N^2\tau) &< 2\gamma_A(-2 + \tau) \\ -4\gamma_B N^2 + 2\gamma_B N^2\tau &< -4\gamma_A + 2\gamma_A\tau \\ 4\gamma_A - 4\gamma_B N^2 &< 2\gamma_A\tau - 2\gamma_B N^2\tau \\ 2(2\gamma_A - 2\gamma_B N^2) &< \tau(2\gamma_A - 2\gamma_B N^2) \\ 2\gamma_A - 2\gamma_B N^2 &< \frac{\tau}{2}(2\gamma_A - 2\gamma_B N^2) \square \end{aligned}$$

**Proof 5:** Scenario 3 Case A – Profit Shifting Opportunities Exist but Unequal - ( $\gamma_A = \gamma_B$ )

From profit function (a.7) and (b.7) it can be shown that  $\pi_A^* - \pi_B^* > 0$ :

$$\begin{aligned} \pi_A^* &> \pi_B^* \\ \frac{(t_A - t_H)^2(1 + N(1 - \tau))^2}{2\gamma_A(1 - t_A) - (N + 1)(t_A - t_H)^2} &> \frac{(t_B - t_H)^2(N + 1 - \tau)^2}{2\gamma_B(1 - t_B) - (N + 1)(t_B - t_H)^2} \\ \frac{(t_H)^2(1 + N(1 - \tau))(1 + N(1 - \tau))}{2(1) - (t_H)^2} &> \frac{(t_B - t_H)(t_B - t_H)(N + 1 - \tau)(N + 1 - \tau)}{2(1 - t_B) - (t_B - t_H)^2} \\ \text{-----A-----} & \quad \text{-----B-----} \end{aligned}$$

Part A

$$\frac{t_H^2 + 2Nt_H^2 - 2N\tau t_H^2 + N^2t_H^2 - 2N^2\tau t_H^2 + N^2\tau^2 t_H^2}{2(1) - (t_H)^2}$$

Part B:

$$\frac{[t_B^2 - 2t_B t_H + t_H^2][N^2 + 2N - 2N\tau - 2\tau + \tau^2 + 1]}{2(1 - t_B) - (t_B - t_H)^2}$$

$$\frac{N^2t_B^2 + 2Nt_B^2 - 2N\tau t_B^2 - 2\tau t_B^2 + \tau^2 t_B^2 + t_B^2 - 2N^2t_B t_H - 4Nt_B t_H + 4N\tau t_B t_H + 4\tau t_B t_H - \dots}{2(1 - t_B) - (t_B - t_H)^2}$$

$$\frac{\dots 2\tau^2 t_B t_H - 2t_B t_H + N^2 t_H^2 + 2Nt_H^2 - 2N\tau t_H^2 - 2\tau t_H^2 + \tau^2 t_H^2 + t_H^2}{2(1 - t_B) - (t_B - t_H)^2}$$

=

$$\frac{t_H^2 + 2Nt_H^2 - 2N\tau t_H^2 + N^2t_H^2 - 2N^2\tau t_H^2 + N^2\tau^2 t_H^2}{2(1) - (t_H)^2}$$

>

$$\frac{N^2t_B^2 + 2Nt_B^2 - 2N\tau t_B^2 - 2\tau t_B^2 + \tau^2 t_B^2 + t_B^2 - 2N^2t_B t_H - 4Nt_B t_H + 4N\tau t_B t_H + 4\tau t_B t_H - \dots}{2(1 - t_B) - (t_B - t_H)^2}$$

$$\frac{\dots 2\tau^2 t_B t_H - 2t_B t_H + N^2 t_H^2 + 2Nt_H^2 - 2N\tau t_H^2 - 2\tau t_H^2 + \tau^2 t_H^2 + t_H^2}{2(1 - t_B) - (t_B - t_H)^2}$$

=

$$\frac{N^2(-2\tau t_H^2 + \tau^2 t_H^2) - N^2(2t_B t_H - t_B^2) + \tau(2Nt_B^2 - 4Nt_B t_H) + \frac{1}{2}\tau(4\tau t_B t_H - 2\tau t_B^2)}{2(1) - t_H^2}$$

>

$$\frac{(-2\tau t_H^2 + \tau^2 t_H^2) + (-2t_B t_H + t_B^2) + (2Nt_B^2 - 4Nt_B t_H) + (4\tau t_B t_H - 2\tau t_B^2)}{2(1 - t_B) - (t_B - t_H)^2} \quad \square$$

**Proof 6:** Scenario 3 Case C – Enforcement levels are higher in Country B

From profit function (a.7) and (b.7) it can be shown that  $\pi_A^* - \pi_B^* > 0$ :

$$\pi_A^* > \pi_B^*$$

$$\frac{(t_A - t_H)^2(1 + N(1 - \tau))^2}{2\gamma_A(1 - t_A) - (N + 1)(t_A - t_H)^2} > \frac{(t_B - t_H)^2(N + 1 - \tau)^2}{2\gamma_B(1 - t_B) - (N + 1)(t_B - t_H)^2}$$

$$\frac{(t_H)^2(1 + N(1 - \tau))(1 + N(1 - \tau))}{\gamma_A - (t_H)^2} > \frac{(t_B - t_H)(t_B - t_H)(N + 1 - \tau)(N + 1 - \tau)}{\gamma_B(1 - t_B) - (t_B - t_H)^2}$$

-----A-----                      -----B-----

Part A

$$\frac{t_H^2 + 2Nt_H^2 - 2N\tau t_H^2 + N^2t_H^2 - 2N^2\tau t_H^2 + N^2\tau^2 t_H^2}{\gamma_A - (t_H)^2}$$

Part B:

$$\frac{[t_B^2 - 2t_B t_H + t_H^2][N^2 + 2N - 2N\tau - 2\tau + \tau^2 + 1]}{\gamma_B(1 - t_B) - (t_B - t_H)^2}$$

$$\frac{N^2t_B^2 + 2Nt_B^2 - 2N\tau t_B^2 - 2\tau t_B^2 + \tau^2 t_B^2 + t_B^2 - 2N^2t_B t_H - 4Nt_B t_H + 4N\tau t_B t_H + 4\tau t_B t_H - \dots}{\gamma_B(1 - t_B) - (t_B - t_H)^2}$$

$$\frac{\dots 2\tau^2 t_B t_H - 2t_B t_H + N^2t_H^2 + 2Nt_H^2 - 2N\tau t_H^2 - 2\tau t_H^2 + \tau^2 t_H^2 + t_H^2}{\gamma_B(1 - t_B) - (t_B - t_H)^2}$$

=

$$\frac{t_H^2 + 2Nt_H^2 - 2N\tau t_H^2 + N^2t_H^2 - 2N^2\tau t_H^2 + N^2\tau^2 t_H^2}{\gamma_A - (t_H)^2}$$

>

$$\frac{N^2t_B^2 + 2Nt_B^2 - 2N\tau t_B^2 - 2\tau t_B^2 + \tau^2 t_B^2 + t_B^2 - 2N^2t_B t_H - 4Nt_B t_H + 4N\tau t_B t_H + 4\tau t_B t_H - \dots}{\gamma_B(1 - t_B) - (t_B - t_H)^2}$$

$$\frac{\dots 2\tau^2 t_B t_H - 2t_B t_H + N^2t_H^2 + 2Nt_H^2 - 2N\tau t_H^2 - 2\tau t_H^2 + \tau^2 t_H^2 + t_H^2}{\gamma_B(1 - t_B) - (t_B - t_H)^2}$$

=

$$\frac{N^2(-2\tau t_H^2 + \tau^2 t_H^2) - N^2(2t_B t_H - t_B^2) + \tau(2Nt_B^2 - 4Nt_B t_H) + \frac{1}{2}\tau(4\tau t_B t_H - 2\tau t_B^2)}{\gamma_A - t_H^2}$$

>

$$\frac{(-2\tau t_H^2 + \tau^2 t_H^2) + (-2t_B t_H + t_B^2) + (2Nt_B^2 - 4Nt_B t_H) + (4\tau t_B t_H - 2\tau t_B^2)}{\gamma_B(1 - t_B) - (t_B - t_H)^2} \quad \square$$