Tax Havens and Cross-border Licensing

Jay Pil Choi† Jota Ishikawa‡ Horofumi Okoshi§

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(Preliminary!)

Abstract

Multinational enterprises (MNEs) have incentive for tax planning through transfer pricing when corporate tax rates are different among countries. The incentive is stronger when MNEs own intangible assets which can easily be shifted across countries. To mitigate such strategic tax saving, the OECD proposed the arm’s length principle (ALP). This paper investigates how the ALP affects MNE’s licensing strategy and welfare in the presence of a tax haven. We deal with two methods of the ALP: the comparable uncontrolled price method and the transactional net margin method. The ALP may distort MNE’s licensing decisions, because providing a license to unrelated firms restricts MNE’s profit-shifting opportunities due to the emergence of comparable transaction. As a result, welfare may deteriorate. When the MNE’s subsidiary and the local firm compete in the market, the ALP harms consumers even with licensing to the local firm and vice versa without licensing to the local firm.

Keywords: Multinational enterprises; Licensing; Royalties; Transfer pricing; Arm’s length principle

JEL classification: D45; F23; H26; L12

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†Department of Economics, Michigan State University and Hitotsubashi Institute for Advanced Study, Hitotsubashi University; E-mail: choolay@msu.edu

‡Faculty of Economics, Hitotsubashi University and RIETI; E-mail: jota@econ.hit-u.ac.jp

§University of Munich, Munich Graduate School of Economics, Seminar for Economic Policy, Akademiestr. 1/II, D-80799 Munich, Germany; E-mail: hiromori.okoshi@gmail.com
1 Introduction

Multinational enterprises (MNEs) have a big presence in the world economy. According to Zucman (2014), the share of global corporate profits made by MNEs is about 15%. It is also reported that MNEs artificially shift their profits across countries to save their tax payments. MNEs take advantage of differences in corporate tax rates and preferential tax measures among countries. For example, Zucman (2014) pointed out that more than 50% of the profits of U.S. firms were reported in low-tax countries in 2012.\(^1\) According to estimation of Torslov et al. (2018), more than 600 billion dollars were shifted to tax havens. Such profit-shifting is often conducted through transfer pricing of intra-firm transactions.\(^2\) With respect to prices of goods and services within a firm (i.e., transfer prices), there is no market mechanism. Thus, MNEs manipulate transfer prices for tax planning, which is called transfer pricing. The OECD countries have cooperatively tackled this problem by setting guidelines for transfer pricing and carrying out the Base Erosion and Profit Shifting (BEPS) project.\(^3\)

The OECD guideline stipulates

> When independent enterprises transact with each other, the conditions of their commercial and financial relations (e.g. the price of goods transferred or services provided and the conditions of the transfer or provision) ordinarily are determined by market forces. (Chapter I, p33)

This is well known as the arm’s length principle (ALP). As a method of the ALP, the comparable uncontrolled price (CUP) method is considered as ideal. The CUP method suggests that the tax authorities audit tax avoidance behaviors by comparing the prices used in intra-firm transactions with the prices of similar uncontrolled transactions between independent parties (i.e., arm’s length (AL) prices).\(^4\)

However, the reality is not so simple. In particular, it is very difficult to audit intra-firm transfers of intangible assets because of the following nature of intangible

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\(^1\)These countries include Ireland, Netherlands, Luxembourg, Switzerland, Bermuda and other Caribbean countries, and Singapore. This share was less than 20% in 1984 and grew over time.

\(^2\)In reality, profit-shifting is carried out in highly complex methods. Well known methods of profit-shifting include transfer pricing of tangible assets, internal debt, and licensing payments. See, for example, Hopland et al. (2018) which introduces multiple methods of profit-shifting in the analysis.

\(^3\)See for example, Hauck (2019) for international fight against tax havens.

assets. First, it is easy to shift intangible assets across countries without accompanying production. Thus, MNEs tend to locate intangible assets in tax havens to minimize their tax payments. For instance, the shifted profits to Ireland by royalties accounted for around 23 percent of its annual GDP between 2010 and 2015. Second and more importantly, finding appropriate fees or royalties is very difficult, because there is often no comparable transaction on such intangible assets.

In the case of transactions of intangible assets, therefore, it is not easy to apply the CUP method. In practice, practitioners heavily rely on a different method called the transactional net margin method (TNMM) because of its ease of application. The method examines the profit level indicator (PLI), defined as net profits relative to an appropriate base such as sales that a taxpayer realizes from a controlled transaction. The idea of the TNMM is that the PLI of the taxpayer from the controlled transaction should be equal to the PLI obtained in comparable transactions by an independent enterprise (henceforth we call this enterprise the reference firm). The selection criteria of the reference firm is that the taxpayer and the reference firm face similar functional risk such as R&D risk and credit risk. This implies that they may not operate in the same industry. Moreover, even if a taxpayer chooses a reference firm for the TNMM, the tax authority often proposes a different reference firm.

According to the Internal Revenue Service, the most frequently used transfer pricing methods for both tangible and intangible property in 2016 was the comparable profits method (CPM) or the TNMM, which accounted for 89%. Furthermore, the most often used PLI is an operating margin, the ratio of operating profits to sales, which accounted

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5 One of the most famous examples of profit shifting through royalties is so-called “Double Irish with a Dutch Sandwich” conducted by Google. It was reported that Google saved at least $3.7 billion in taxes in 2016. https://www.irishtimes.com/business/economy,double-irish-and-dutch-sandwich-saved-google-3-7bn-in-tax-in-2016-1.3343205

6 See Dischinger and Riedel (2011), Karkinsky and Riedel (2012), and Griffith et al. (2014) among others for empirical evidence of location choice of intangible assets.

7 See Financial Times. https://www.ft.com/content/d6a75b56-215b-11e8-a895-1ba1f72e2c11

8 As pointed out by OECD guidelines, “Tax administrations should not automatically assume that associated enterprises have sought to manipulate their profits. There may be a genuine difficulty in accurately determining a market price in the absence of market forces or when adopting a particular commercial strategy. (Chapter I, p33)“

9 For details, see https://www.irs.gov/irb/2017-15_IRB. The CPM is mainly used in U.S. to calculate appropriate transfer prices. Basically, these two methods are the same but one difference is that the TNMM deals with investigation based on transaction unit while the CPM investigates firm level transactions.
Against this background, we explore the relationship between the ALP and MNE’s technology transfer through licensing. Specifically, we investigate how the ALP affects MNE’s licensing strategy in the presence of a tax haven. On one hand, if the MNE decides to license its technology to unrelated firms, then comparable transaction appears and the CUP method becomes applicable. That is, the MNE needs to set the same royalty for both related and unrelated parties. On the other hand, if the MNE transfers its technology only internally, then there is no comparable transaction and the tax authority relies on the TNMM. When making a licensing decision, the MNE faces a trade-off between the license revenue from the unrelated parties and the more opportunity of profit-shifting through transfer pricing. Thus, the presence of the ALP may affect MNE’s licensing decision.

We contribute to the transfer pricing literature by capturing the aspect of profit-shifting through intangible assets. Despite the importance of profit-shifting, most papers deal with the intra-firm transactions through physical products, internal debt, and interest payments. Profit-shifting via intangible assets has been analyzed in only a few studies including Hopland et al. (2018) and Juranek et al. (2018a,b). They incorporated royalty payments in their analysis but none of them considers licensing to external firms. Moreover, despite of the fact that licensing improves production costs of firms, the interaction between licensing and market has been overlooked as the previous literature often considers perfectly competitive markets.

Many studies on licensing assume either licensing by means of a per-unit royalty or a fixed fee alone. However, as documented in San Martin and Saracho (2010), most of licensing uses the ad-valorem scheme for royalty payments instead of a per-unit royalty or a fixed fee. In the main analysis, therefore, we focus on ad valorem royalties as licensing payments.

We show that the ALP increases tax revenue but may hurt consumers. As a result, the ALP worsens economic welfare. Choi et al. (2018) also show that consumers lose from the ALP and economic welfare may deteriorate. Since their market structure is different from ours, however, their channel through which consumers get hurt is also different from ours.

The rest of paper is organized as follows. The next section presents a simple setup and
analyzes the incentive of licensing strategy in the case of ad valorem royalties. Section 3 explores welfare effects. Section 4 extends the basic model in two directions. The last section concludes.

2 Basic Model

Consider a world composed of the domestic country, the foreign country, and the third country, labelled $D$, $F$, and $H$, respectively. Country $H$ is a tax haven. The corporate tax rate in country $H$ is lower than that in country $D$ and is normalized to be zero. We assume for simplicity that there is no source tax on royalty payments.\(^{11}\) There are a single MNE, the headquarters of which is located in country $F$, and a single local firm (called firm $Y$) in country $D$. A subsidiary of the MNE in country $D$ (called firm $X$) and firm $Y$, respectively, produce goods $X$ and $Y$. The two goods are independent and not substitutable.\(^{12}\) Thus, each firm is a monopolist in country $D$. As we are primarily interested in MNE’s profit-shifting from the domestic country to the tax haven and domestic welfare consequences of introducing the ALP, we assume that both goods are consumed only in country $D$.

The original marginal cost (MC) of producing good $i$ ($i = X, Y$) is $c_i$, but the MNE owns a patent which can reduce the MCs. Although the two goods are not substitutes, the patented technology is assumed to be applied to the production of both goods. With the patent, each firm can reduce its MC from $c_i$ to zero. Thus, firm $X$’s MC is always zero, while firm $Y$’s MC is zero only when the patent is granted to the local firm. We assume that the licensing contract is by means of ad valorem royalties.\(^{13}\) The MNE offers ad valorem royalties $r_x$ for internal licensing (i.e., licensing to firm $X$) and $r_y$ for external licensing (i.e., licensing to firm $Y$), respectively.

Let us define the monopoly profits as $\pi_i(\omega)$ when its marginal cost is given by $\omega$ ($i = X, Y$). Since the internal licensing always occurs, firm $X$’s profits are always $\pi_x(0)(\equiv \pi_{x0})$. Firm $Y$’s profits depend on whether licensing takes place or not. The profits are $\pi_y(c_y)(\equiv \pi_{yc})$ without licensing and $\pi_y(0)(\equiv \pi_{y0})$ with licensing.

We solve the following three-stage game. In the first stage, the MNE decides internal and external royalty rates. The MNE specifically makes a take-it-or-leave-it offer to firm

\(^{11}\) For example, royalty payments within EU are exempt from the source tax.

\(^{12}\) In section 4, we consider the case in which the goods are substitutes.

\(^{13}\) Basically, the effects of licensing by means of fixed fees are equivalent to those by means of ad valorem royalties.
After firm $Y$ observes the royalty rates, it decides whether to accept the license contract. Finally, firms $X$ and $Y$ produce and supply their products in country $D$.

2.1 The benchmark case: Without a tax haven

In order to clarify the effects of a tax haven and the ALP, this subsection analyzes the case without the tax haven. We assume that the domestic corporate tax rate, $t$, and the foreign corporate tax rate are the same.$^{14}$

**Market outcome** The MNE has a patent which reduces the marginal cost from $c_i$ to 0. Therefore, the subsidiary’s marginal cost is always 0 while the local firm’s marginal cost is either $c_y$ or 0. If the MNE grants a license to the local firm, the local firm pays a license fee to the MNE. The royalty rate of the license is $r_y \in [0, 1]$. Formally, the profits can be written as

$$
\Pi_x = (1 - t)(\pi_{x0} + \lambda r_y \pi_{y0}), \quad (1)
$$

$$
\Pi_y = (1 - t)\{\lambda(1 - r_y)\pi_{y0} + (1 - \lambda)\pi_{yc}\}, \quad (2)
$$

where $\lambda$ is a binary variable which takes one if the external licensing arises and zero otherwise. The outputs of each firm can be written as

$$
x = x(0), \quad \text{and} \quad y = \lambda y(0) + (1 - \lambda)y(c_y). \quad (3)
$$

A change in $t$ does not affect the output levels.

**License contract** Given eqs.(2) and (3), the local firm accepts the licensing offer if and only if

$$
\Pi_y|_{\lambda=1} \geq \Pi_y|_{\lambda=0} \iff r_y \leq 1 - \frac{\pi_{yc}}{\pi_{y0}} = \frac{\Delta}{\pi_{y0}}, \quad (4)
$$

where $\Delta \equiv \pi_{y0} - \pi_{yc} > 0$. As the two firms do not interact in the markets, the MNE is always willing to license its technology to the local firm. From eq.(1), it is always optimal for the MNE to obtain license revenue by setting the highest royalty subject to eq.(4), $r_y = \frac{\Delta}{\pi_{y0}} \equiv r_y^* (< 1)$. In other words, the MNE would set the royalty rate such that license revenue equals $\pi_{y0} - \pi_{yc}(\equiv \Delta)$.

$^{14}$Even if the foreign tax rate is higher than the domestic one, the analysis in this subsection would not change with an assumption that the MNE establishes a shell company in the domestic country and transfers its patent to the shell company.
In equilibrium, the profits become

\[ \Pi^*_x = (1-t)(\pi x_0 + \Delta) \quad \text{and} \quad \Pi^*_y = (1-t)(1-r^*_y)\pi y_0 = (1-t)\pi y_c. \]  

(5)

As easily seen from the above equation, the optimal license contract makes the local firm indifferent between with and without licensing.

### 2.2 A tax haven without the ALP

We now introduce a tax haven into the analysis. We assume that the MNE establishes a shell company, firm S, in country H without any cost. Obviously, transferring the patent to the shell company is the optimal strategy for the MNE, because it can make more profits in the tax haven via not only profit-shifting from firm X but also license revenue from firm Y.

\[ \Pi^{TH}_x = (1-t)(1-r_x)\pi x_0 + r^{TH}_x\pi x_0 + r^{TH}_y\pi y_0, \]
\[ \Pi^{TH}_y = (1-t)(1-r^{TH}_y)\pi y_0. \]

We first consider the case without the ALP. This means that the MNE can set ad valorem royalties without any constraint. Obviously, the optimal royalty rate is such that all profits of firm X are shifted to firm S, that is, \( r^{*TH}_x = 1 \) while the arm’s length royalty rate is the same as the benchmark case, i.e., \( r^{*TH}_y = r^*_y \).

As a result, we obtain the same licensing strategy as the benchmark case in equilibrium. This is because the country where the MNE reports the tax base simply changes from country D to country H. Since the corporate tax is proportionally imposed on the profits, the tax rates never affect the licensing strategy. Therefore, the post-tax profits are computed as

\[ \Pi^{TH}_x = \pi x_0 + \Delta, \quad \text{and} \quad \Pi^{TH}_y = (1-t)\pi y_c \left( = \Pi^*_y \right). \]  

(6)

### 2.3 A tax haven with the ALP

Finally, we investigate the effect of the ALP in the presence of a tax haven. The ALP restricts the MNE’s profit-shifting strategy following one of two methods, the comparable uncontrolled price (CUP) method and the transactional net margin (TNM) method.

First, if the MNE licenses the technology to the local firm, the CUP method applies. The MNE is unable to price discriminate due to the emergence of a comparable transaction and arm’s length royalty. Put differently, the MNE must set a uniform royalty rate,
$r_{\text{CUP}}$. The MNE’s problem can be stated as

$$
\max_{r_{\text{CUP}}} \Pi_{\text{CUP}}^x = (1-t)(1-r_{\text{CUP}})\pi_{x0} + r_{\text{CUP}}(\pi_{x0} + \pi_{y0}) \\
= (1-t)(1 + \frac{t}{1-t} r_{\text{CUP}})\pi_{x0} + r_{\text{CUP}} \pi_{y0}
$$

subject to

$$
\Pi_{\text{CUP}}^y|_{\lambda=1} \geq \Pi_{\text{CUP}}^y|_{\lambda=0} \iff r \leq 1 - \frac{\pi_{yc}}{\pi_{y0}} = r^*(<1).
$$

As $\Pi_{\text{CUP}}^x$ is strictly increasing in $r_{\text{CUP}}$, the optimal royalty rate is given by $r^*_{\text{CUP}} = r^*_y$.

This strategy generates the following post-tax profits:

$$
\Pi_{\text{CUP}}^x = (1-t) \left[ 1 + \frac{t}{1-t} \left( 1 - \frac{\pi_{yc}}{\pi_{y0}} \right) \right] \pi_{x0} + \Delta \tag{7}
$$

$$
\Pi_{\text{CUP}}^y = (1-t)\pi_{yc} (= \Pi_{y}^* = \Pi_{y}^{\text{TH}}). \tag{9}
$$

Note that the imposition of the ALP does not mean that the MNE cannot engage in profit-shifting.\textsuperscript{15} As seen in eq.(7), the MNE shifts only a part of profits to the tax haven. As discussed in Section 2.1, $r^*_{\text{CUP}}$ is determined only by the market condition of good Y. This means that the MNE’s global post-tax profits under the CUP method become larger as $\Delta$ becomes larger.

Alternatively, if the MNE does not license its technology, no comparable transaction appears, and then the royalty rate is regulated by the TNM method. With the TNM method, the royalty rate $r^*_{\text{TNM}}$ is set such that the PLI of firm $X$ equals the PLI of the reference firm which is exogenously given in this subsection. We denote such a royalty rate by $\eta$. That is, $r^*_{\text{TNM}} = \eta$ holds. Thus, we have the following post-tax profits under the TNM method:

$$
\Pi_{\text{TNM}}^x = (1-t)(1-\eta)\pi_{x0} + \eta\pi_{x0} \tag{10}
$$

$$
= (1-t)\pi_{x0} + t\eta\pi_{x0}; \tag{11}
$$

$$
\Pi_{\text{TNM}}^y = (1-t)\pi_{yc} (= \Pi_{y}^* = \Pi_{y}^{\text{TH}} = \Pi_{y}^{\text{CUP}}). \tag{12}
$$

\textsuperscript{15}In the literature, ALP requires MNEs to set the same transfer price as perfectly competitive market price or true marginal production cost, which completely eliminates the opportunity of profit shifting. In our model, however, ALP makes the royalties equal between related and unrelated firms. Thus, the MNE still enjoys profit-shifting.
A comparison of the two post-tax profits shows the condition whether to license the technology to the local firm. Formally, the MNE grants the license to the local firm if and only if

\[
\Gamma \equiv \Pi^*_{x}^{CUP} - \Pi^*_{x}^{TNM} = \left(1 - t\right) \left[1 + \frac{t}{1 - t} \left(\frac{\Delta}{\pi_{y}^{0}}\right)\right] \pi_{x0} + \Delta \right) - \{(1 - t)\pi_{x0} + t\eta\pi_{x0}\}
\]

\[
= \Delta - t \left[ \eta - \frac{\Delta}{\pi_{y}^{0}} \right] \pi_{x0} > 0.
\]

We can easily confirm

\[
\frac{\partial \Gamma}{\partial \eta} < 0, \quad \frac{\partial \Gamma}{\partial t} < 0, \quad \frac{\partial \Gamma}{\partial \pi_{x0}} < 0, \quad \frac{\partial \Gamma}{\partial \Delta} > 0.
\]

Thus, given the other parameters, we can define a threshold of \(\eta, \eta, \) such that the MNE is indifferent between licensing and non-licensing. Licensing arises if and only if \(\eta \leq \eta = r_{y}^{*}.\) Similarly, we can define thresholds \(\pi_{x0}^{*}, \Delta^{*}, \) respectively.

We have the following proposition.

**Proposition 1** The introduction of the ALP in the presence of the tax haven results in non-licensing if \(\eta, t, \) or \(\pi_{x0}^{*} \) is sufficiently large or if \(\Delta \) is sufficiently small.

The proposition is intuitive. The MNE faces a trade-off between the license revenue from the local firm and the profit-shifting from its subsidiary to the tax haven. The latter is likely to dominate the former as \(\eta, t, \) and \(\pi_{x0}^{*} \) become larger and \(\Delta \) becomes smaller.

**3 Welfare analysis**

Following Kind et al. (2005), we assume that the MNE is owned by residents in the foreign country and hence domestic welfare is composed of consumer surplus, firm Y’s profits, and domestic tax revenue. Note that firm Y’s profits are always constant and equal to \((1 - t)\pi_{y}^{c}\) and consumer surplus in the market of good X also remains constant. Thus, a change in domestic welfare is simply the sum of changes in consumer surplus in the market of good Y, CS, and in tax revenue from the MNE, TR. Obviously, CS is larger with licensing than without licensing.
Domestic welfare with the tax haven but without the ALP is always less than that in the benchmark case, because the presence of the tax haven does not affect the licensing strategy but leads to leakage of tax revenue from the domestic country to the tax haven. Thus, the presence of the tax haven is always harmful for the domestic country as long as the ALP is absent.

If the introduction of the ALP does not affect the licensing strategy of the MNE, that is, if the MNE is still engaged in licensing with the ALP, the impact of the ALP is also straightforward. Obviously, $CS$ is not affected. Under the CUP, MNE’s profit-shifting is restricted, meaning $TR$ increases. Thus, the ALP increases domestic welfare by $t(1 - r^{*CUP})\pi_0$, implying $W^{*CUP} > W^{*TH}$ holds. However, if the ALP changes the licensing strategies, that is, if the MNE stops licensing under the ALP, a trade-off arises. On one hand, the ALP decreases MNE’s profit-shifting to the tax haven and hence $TR$ increases. On the other hand, non-licensing lowers productivity of the local firm and hence $CS$ decreases. Thus, $W^{*TNM} > W^{*TH}$ may or may not hold.

$W^{*TNM}$ is decreasing in $\eta$ while both $W^{*CUP}$ and $W^{*TH}$ are independent of $\eta$. Thus, $W^{*TNM} > W^{*CUP}$ and $W^{*TNM} > W^{*TH}$ are likely if $\eta$ is close to 0 and vice versa if $\eta$ is close to 1. Recall that whether or licensing occurs depends on $\Gamma(\equiv \Pi_x^{*CUP} - \Pi_x^{*TNM})$. We let $\eta$ denote the level of $\eta$ with which $\Gamma = 0$. Then, licensing occurs if and only if $\eta \leq \eta_{TNM}^{TH}$. 

The following computation with linear demands clarifies this point. Suppose that the inverse demands are given by

$$p_x = A - ax \quad \text{and} \quad p_y = B - by.$$ 

First, domestic welfare without the ALP, $W^{TH}$, is compared to that with the TNM method, $W^{TNM}$:

$$W^{TNM} - W^{TH} = CS(\lambda = 0) - CS(\lambda = 1) + t(1 - \eta)\frac{A^2}{4a}$$

$$= -\frac{c_y(2B - c_y)}{8b} + t(1 - \eta)\frac{A^2}{4a} \geq 0 \iff \eta \leq 1 - \frac{ac(2B - c_y)}{2tbA^2} \equiv \eta_{TH}^{TNM}.$$  

$W^{TNM} < W^{TH}$ holds if $\eta > \eta_{TH}^{TNM}$. This is simply because greater $\eta$ results in more opportunity of profit-shifting for the MNE. The increase in tax revenue caused by the ALP, which is the TNM method in this case, is not enough to cover the decrease in consumer surplus in the market of good $Y$. 

10
We can derive the condition under which $\eta < \eta_{TH}^{TNM}$ holds:

$$\eta < \eta_{TH}^{TNM} \iff t > \frac{aB^2(2B^2 + 2Bc_y - c_y^2)}{(B - c_y)^2} \equiv \underline{t}.$$ 

Thus, with $t < \underline{t}$, $W^{*TNM} < W^{*TH}$ necessarily holds. On the other hand, with $t > \underline{t}$, $W^{*TNM} < W^{*TH}$ only if $\eta > \eta_{TH}^{TNM}$.

Let $\eta_{CUP}^{TNM}$ be a threshold of $\eta$ at which $W^{*TNM} = W^{*CUP}$ holds. That is, $\eta_{CUP}^{TNM} = \eta_{TH}^{TNM} - (1 - r_{TH}^{TH})$. $W^{*TNM} < W^{*CUP}$ holds if $\eta > \eta_{CUP}^{TNM}$. Since we obtain

$$\eta - \eta_{CUP}^{TNM} = \frac{a}{tbA^2} \left( B^2 + \frac{c_y(2B - c_y)}{2} \right) > 0,$$

$W^{*TNM} < W^{*CUP}$ necessarily holds at $\eta = \underline{\eta}$.

The results are illustrated in the Figure 1, 2 and 3 and summarized in the following proposition.

**Proposition 2** With $t < \underline{t}$, the presence of the ALP improves domestic welfare if and only if $\eta < \underline{\eta}$. With $t > \underline{t}$, the presence of the ALP improves domestic welfare if and only if $\eta > \eta_{TH}^{TNM}$.

We now take the choice of $\eta$ into account. As described in the introduction, the tax authority takes the initiative when selecting the reference firm. Although the government cannot freely choose the reference firm and hence $\eta$, it still has some freedom of the choice.

We consider an extended game where in Stage 0, prior to MNE’s decision on royalty rates, the domestic government chooses $\eta$ to maximize domestic welfare. We assume that the government can choose $\eta \in [\overline{\eta}, \tilde{\eta}]$ where $0 < \overline{\eta} < \tilde{\eta} < 1$. Then, it is straightforward that the optimal royalty rate with the TNM method $\eta^*$ is given by $\eta^* = \overline{\eta}$ if $\underline{\eta} \leq \overline{\eta}$ and $\eta \leq \eta^* \leq \min\{\overline{\eta}, \tilde{\eta}\}$ if $\underline{\eta} < \overline{\eta}$.

### 4 Extensions

This section deals with two extensions of the basic model. In the first extension, we deal with the case in which two goods are substitutes. In this case, the local firm is a rival for the MNE and strategic interactions arise between the MNE and the local firm. We specifically show that licensing may harm consumers and hence non-licensing caused by the ALP improves domestic welfare.
In the second extension, we assume that there are two potential licensees in the domestic country. We specifically point out that when the royalty rates are different between the licensees, the government may not select the lower royalty rate as the reference rate.

4.1 Substitutable goods

In the last section, to make our point clearly, we have assumed that both goods $X$ and $Y$ are not substitutable at all. In this subsection, we consider the case in which the two goods are substitutable. Specifically, we assume that the MNE and the local firm produce a homogeneous good and are engaged in Cournot competition. We also assume linear demand:

$$p = A - a(x + y).$$
4.1.1 Without a tax haven

We begin with the case without a tax haven. The profits of the both firms are

$$\Pi_x = (1-t)(px + \lambda rpy) \left| \frac{\pi_x}{\pi_x(\lambda=1)} \right),$$

$$\Pi_y = (1-t)(\lambda(1-ry)py) \left| \frac{\pi_y(\lambda=1)}{\pi_y(\lambda=1)} \right) + (1-\lambda)(p-cy)y).$$

(18)

In the following analysis, the MNE is assumed to make centralized decisions.

If the MNE does not grant a license to the local firm (or, $\lambda = 0$), the equilibrium is given by

$$x^*|_{\lambda=0} = \frac{A + cy}{3a}, \quad y^*|_{\lambda=0} = \frac{A - 2cy}{3a}, \quad p^*|_{\lambda=0} = \frac{A + cy}{3},$$

$$\Pi_x^*|_{\lambda=0} = (1-t)\frac{A + cy)^2}{9a}, \quad \Pi_y^*|_{\lambda=0} = (1-t)\frac{(A - 2cy)^2}{9a}.$$  (19)

If the MNE licenses its technology to the local firm (or, $\lambda = 1$), the first order conditions are

FOC for $x$ : $A - 2ax - ay - r_yay = 0,$  (20)

FOC for $y$ : $(1-ry)(A - ax - 2ay) = 0,$  (21)

which yield the following output and price levels

$$x^*|_{\lambda=1} = \frac{(1-ry)A}{(3-ry)a}, \quad y^*|_{\lambda=1} = \frac{A}{(3-ry)a}, \quad p^*|_{\lambda=1} = \frac{A}{3-ry}.$$  

Given these equilibrium outcomes, the profits are

$$\Pi_x^*|_{\lambda=1} = (1-t)\left(\frac{(1-ry)A^2}{(3-ry)^2a} + \frac{r_y(1-ry)A^2}{(3-ry)^2a}\right), \quad \Pi_y^*|_{\lambda=1} = (1-t)\frac{(1-ry)A^2}{(3-ry)^2a}.$$  

Then we obtain

$$\Pi_y^*|_{\lambda=1} \geq \Pi_y^*|_{\lambda=0} \iff r_y \leq \frac{A\sqrt{A^2 + 32Ac - 32c^2} - (A^2 + 8Ac - 8c^2)}{2(A - 2cy)^2} \equiv r_y^*.$$  

4.1.2 A tax haven without the ALP

In the presence of a tax haven, the MNE’s profits are

$$\Pi_x^{TH} = (1-t)(1-r_x)px + r_xpx + r_ypy = \xi px + r_ypy,$$  

14
where \( r_x \) represents the internal royalty rate and \( \xi = 1 - t + tr_x \). In this case, FOC is also a function of \( \xi \). We can obtain similar expressions of equilibrium variables as the case without a tax haven:

\[
x^{TH}\big|_{\lambda=1} = \frac{(\xi - r_y) A}{(3\xi - r_y)a}, \quad y^{TH}\big|_{\lambda=1} = \frac{\xi A}{(3\xi - r_y)a}, \quad p^{TH}\big|_{\lambda=1} = \frac{\xi A}{3\xi - r_y},
\]

and the MNE’s post-tax profits of the MNE are

\[
\Pi^{TH}_x\big|_{\lambda=1} = \frac{\xi^3 A^2}{(3\xi - r_y)^2a} \quad \text{and} \quad \frac{\partial \Pi^{TH}_x}{\partial \xi} = \frac{3A^2\xi^2}{a(3\xi - r_y)^3}(2\xi - r_y)t > 0.
\]

Thus, the MNE sets the internal royalty rate as high as possible (i.e., \( r^{*TH}_x = 1 \)) in the absence of ALP. With \( r^{*TH}_x = 1 \), \( \xi = 1 \) also holds and hence the optimal arm’s length royalty becomes \( r^{*TH}_y = r^{*}_y \) which is the same as the case without the tax haven.

Therefore, the MNE’s equilibrium profits are given by

\[
\Pi^{*TH}_x\big|_{\lambda=1} = \frac{(1 - r^{*TH}_y) A^2}{(3(1 - t + tr^{*TH}_y) - r^{*TH}_y)^2a} + r^{*TH}_y(1 - r^{*TH}_y) A^2 \bigg((3(1 - t + tr^{*TH}_y) - r^{*TH}_y)^2a\bigg).
\]

### 4.1.3 A tax haven with the ALP

In the case of licensing with the ALP, the MNE cannot discriminate between its subsidiary and the local firm. The optimal royalty rate is determined by

\[
\Pi^{*CUP}_y = (1 - t)(1 - t + tr^{*CUP}) A^2 = (1 - t)\frac{(A - 2c_y)^2}{9a} = \Pi^{*TNM}_y.
\]

In the case of non-licensing, the MNE has to set the transfer price equal the comparable value \( \eta \). Thus, the MNE’s profits are, respectively,

\[
\Pi^{*CUP}_x = (1 - t)\frac{(1 - t + tr^{*CUP}) A^2}{(3(1 - t + tr^{*CUP}) - r^{*CUP})^2a} \quad \text{and} \quad \Pi^{*TNM}_x = (1 - t)(1 - \eta)px + \eta px.
\]

\( \Pi^{*CUP}_x > \Pi^{*TNM}_x \) may or may not hold. We can confirm that \( \Gamma < 0 \) is possible only if \( c_y \) is small. Small \( c_y \) implies that licensing is not very attractive to the MNE. Figure 4 shows that \( \Gamma = \Pi^{*CUP}_x - \Pi^{*TNM}_x \) which is measured by the vertical axis becomes negative if \( t \) is not large with a small \( c_y \).\(^{16}\)

\(^{16}\)Figure 4 is drawn with \( c_y = \frac{1}{1000} \) \( t \) and \( \eta \), respectively, take \( 0 < t < 1 \) and \( 0 < \eta < \frac{1}{2} \).
The MNE tries to reduce the tax payments through 2 channels. The first channel is to shift the profits of its subsidiary to the tax haven. This channel is likely to be more efficient when the MNE is not engaged in licensing. The second is to increase the license revenue from the local firm. For this channel, licensing is necessary. When $t$ is not large, the first channel dominates the second channel. The MNE tries to take advantage of the first channel and hence it is more unlikely to license its technology to the local firm.

4.1.4 Welfare comparison

We can show the following lemma. (The proof will be provided.)

**Lemma 1** *In the presence of the ALP, the total supply of the good is greater without licensing than with licensing (i.e., $x^\star_{CUP} + y^\star_{CUP} < x^\star_{TNM} + y^\star_{TNM}$).*

The lemma is surprising because the total output is less with licensing regardless licensing leads both firms to produce the good with zero MC. The negative effect on the total output caused by MNE’s centralized decision with licensing by means of ad valorem royalties dominates the positive effect of the cost reduction of the local firm. When the goods are substitutes, the MNE decreases the output of its subsidiary to increase the output of local firm and the price. As a result, the MNE obtains more license payment from the local firm.
Figure 5 compares domestic welfare between the CUP method and the TNM method, i.e., $W^{*\text{CUP}} - W^{*\text{TNM}}$. Figure 6 compares domestic welfare under the CUP method with domestic welfare without the ALP, i.e., $W^{*\text{CUP}} - W^{*\text{TH}}$.

Thus, noting that the ALP increases the tax revenue, the following proposition is established.

**Proposition 3** Suppose that the MNE’s subsidiary and the local firm compete in the market. The ALP harms consumers and may worsen domestic welfare if the MNE keeps licensing to the local firm but benefits consumers and improves domestic welfare if the MNE stops licensing to the local firm.

4.2 Multiple potential licensees

We next consider the case in which there are multiple potential licensees. Suppose that there are two potential licensees (firms Y and Z) in the domestic country and that the royalty rate of firm Y is greater than that of firm Z (i.e. $r_y > r_z$) without ALP.\(^\text{17}\) Firm $i$ ($i = Y, Z$) produces good $i$. When the CUP method is applied, the domestic government is likely to choose $r_z$ as the reference royalty rate to have the larger tax revenue. However, since the profit-shifting is smaller with $r_z$ than with $r_y$, the MNE may stop licensing its

\(^{17}\)It is assumed that fair, reasonable, and non-discriminatory (FRAND) licensing is not applicable in our analysis.
technology to firm $Z$ to have $r_y$ chosen as the reference royalty rate. If the license is not granted to firm $Z$, consumers of good $Z$ lose. Expecting this, the domestic government may choose $r_y$ as the reference royalty rate instead of $r_z$.

The following example illustrates the above claim. *(The example will be provided.)*

Thus, we obtain the following proposition.

**Proposition 4** Suppose that the royalty rates are different between local firms without the ALP. The government may allow the higher royalty rate as the reference rate with the CUP, even though such a choice decreases the tax revenue from the MNE’s subsidiary.

## 5 Concluding remarks

This paper has dealt with MNE’s transfer pricing of intangible assets which is licensed by means of ad valorem royalties. Specifically, we have explored the effects of the ALP on MNE’s licensing strategy and welfare in the presence of a tax haven.

Our analysis has two messages. First, the ALP may distort MNE’s licensing strategy. In the absence of the ALP, the MNE is willing to offer a licensing contract to an unrelated firm regardless of the existence of a tax haven. In the presence of the ALP, however, the MNE may refrain from offering the contract and comparable transaction of licensing may vanish, which enables the MNE to enjoy more opportunity for profit-shifting from its subsidiary.
Second and more importantly, the disincentivization of licensing may worsen welfare of high-tax countries. One may expect that anti tax-avoidance policies such as BEPS actions prevent MNEs from profit-shifting and contribute to welfare improvement through an increase in tax revenue. Our model, however, has shown that such a positive aspect may appear at the expense of consumers, because the MNEs may stop licensing to remove comparable transactions.

We also investigated two extensions. In the first extension, the goods are substitutes. In this case, consumers may lose even if the licensing still occurs with the ALP. This is because the MNE decreases the output of its subsidiary to take more advantage of the license revenue from the local firm. In the second extension, there are multiple local licensees. In this case, the domestic government may have incentive to manipulate the reference royalty rate to improve domestic welfare.

Although our model shed new light on the link between licensing and profit-shifting, further analysis on this topic is essential. One of potential extensions is to consider policies the focuses of which are more on patent such as the patent box. Even though several empirical studies have focused on such policies rapidly prevailing in Europe, theoretical analyses are not very satisfactory.

References


