The Halal Trade War *

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Abstract

This paper analyzes the strategic halal policy where the duopoly firms invest into the halal certification under their governments' subsidization policies. We analyze the firms' halal level-price choices and the governments' optimal halal certification investment policies. The analysis is based on third-country model that is modeled in three-stage game. In the first stage the governments determine an optimal policy and in the following stages the firms first compete in halal certification level and then export to an imperfectly competitive third-market. The study shows, among others, that the governments' optimal halal certification policy, subsidy or tax, depends on the degree of firms' halal-price competition.

Keywords. *Halal Trade, Strategic Trade Policy, Halal-Price Competition*

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1 Introduction

The halal trade volume has reached a significant level recently[1]. Consumers choose a halal good based on the halal logo that may reflect their conviction on the standards or level of halal. Generally, each government has its own halal standard and logo [2]. Halal Malaysia (2014) has approved a number of international bodies for halal certification. The motives of a government policy targeted at product halal standards, may simply be a response to the need for consumer protection due to asymmetric information about product halal level. For instance, Abdul Raufu and Ahmad Naqiyuddin (2014) report that in Malaysia, consumers strongly are attracted by the halal logo. However, such policies may also be a means to protect the domestic industries from import competition or to capture international market shares. Halal certification can be classified as a social concern part in a wide variety of standard issues. There have been increasing studies on the effect of standards policy on trade since it became important in the global trading system. Swinnen and Vandemoortele (2012) review the literature in standards and conclude that product standards can act as a barrier to trade.

The purpose of this study is to propose a model that explains the implication of a strategic-trade policy or rent-shifting motive for policy applied to investment in halal certification improvement. In particular, we adopt a third-country model of Brander and Spencer (1985) while displaying the main features of product-quality variety of Ishii (2013b). Ishii (2013b) argues that the firm can set a higher price if the product quality is superior. Whereas, Zhou et al. (2002) shows that for the less developed country (the developed country), a unilateral policy involves a subsidy (tax) to investment in quality under Bertrand competition and a tax (subsidy) under Cournot competition. These previous studies show that product

[1] Abdul-Talib and Abd-Razak (2013) report that in 2010 the level reached USD 2.3 trillion, and is increasing as the world total population is estimated to be about 2 billion people.

[2] For instance, Zairy and Norazlina (2007) report such example of government intervention in halal market that is the implementation of the Halal Hub policy in Malaysian's National Economic Plan.

characteristics affect the government policies. Thus it is worthwhile to establish a model of an imperfectly competitive halal market.

A firm must invest in halal certification compliance process such as food testing in order to get and maintain the certification. Furthermore, the process may vary among governments and that may reflect investment cost. We generalize this process by introducing a halal level function that represents the correlation between the cost of investment and the halal level. Consumers consider the halal level in their utility function. Thus it has an impact on consumers' utility maximization and eventually will be reflected in the demand function. As a result, the consumers' perception on a particular halal logo will change the government's policies and the behavior of the firm. We employ a three-stage game to illustrate the interaction of these entities. In the first stage, the government maximizes its welfare by determining its policy. In the second stage, the firms determine the halal certification investment. In the last stage, the firms compete in prices. Among others, the results show that the government's policy depend on the degree of the halal-price competition. Furthermore, as have been discussed in previous literature, the subsidy may give an advantage to the firms in the imperfectly competitive market.

The rest of the paper is organized as follows. Section 2 constructs the basic assumptions and model. Section 3 examines the price-setting stage. Section 4 analyzes the halal investment that affect the halal level. Section 5 discusses the government's optimal policy. Section 6 presents the conclusion.

2 Assumptions and Model

Let us suppose an international duopoly that is composed of two firms in home and foreign countries that produce halal products whose halal levels are determined endogenously by themselves. Both firms export all their products to a third country. The home firm has

supplied a high level halal good (more reliable) and has earned a good reputation in the third country. In contrast, the foreign firm has supplied a low level halal good (less reliable) and has earned a poor reputation. Let's assume that the foreign firm survives in the industry with its poor reputation halal good because it earns a non-negative profit.

When the firms in the industry supply halal goods which use different halal logos, customers in the third country must explicitly appreciate this quality difference between the logos in their utility functions. In other words, consumers recognize these halal level differences in their utility functions. Hence, we assume that the utility function of a representative consumer in the third country is given by

$$u(x, x^*, h, h^*) = e(x + x^*) + k(hx + h^*x^*) - \frac{m(x^2 + x^{*2})}{2} - nxx^* + z, \qquad (m > n)$$

where $x(x^*)$ and $h(h^*)$ are the demand, and the halal level of the goods respectively.; z is the demand for the aggregated good (e.g. numéraire) and e, k, m and n are all positive constants (a superscript,*, denotes the variables of the foreign country)[3]. Hence, the demand functions for the goods, x and x^*, are respectively represented by:

$$x = A - ap + bp^* + \alpha h - \beta h^* \tag{1}$$

$$x^* = A - ap^* + bp + \alpha h^* - \beta h \tag{2}$$

where $p(p^*)$ is the price of the home(foreign) good, $A = \dfrac{(m-n)e}{(m^2-n^2)}$, $a = \dfrac{m}{m^2-n^2}$, $b = \dfrac{n}{m^2-n^2}$, $\alpha = \dfrac{km}{m^2-n^2}$, and $\beta = \dfrac{kn}{m^2-n^2}$. Under the condition of $n < m$, we have

[3]This type of utility function is used in Ishii (2013b). The utility function that explicitly appreciate product qualities is $U(q_1, q_2) = \alpha(q_1 + q_2) - (\beta/2)({q_1}^2 + {q_2}^2) - \gamma q_1 q_2 + z$, where α, β, and γ are positive constants and $\beta > \gamma$ shows that the preferences are biased toward a consumption of varieties. (Singh and Vives, 1984; Ottaviano et al., 2002). This type of utility function explicitly considers product qualities and quality information bias in addition to product quantities (Ishii, 2013a).

$$0 < b < a, 0 < \beta < \alpha, 0 < \alpha\beta = ab, \qquad 0 < A. \tag{3}$$

Equation(1) shows the consumers' preferences for a "love of variety". Meanwhile, equation(1) and equation(3) show that although a rise in the halal level(price) of each firm's good increases (decreases) the demand for its own good and reduces the demand for its rival's good, it raises (reduces) the total demand for the two goods, and vice versa. Equation (3) also indicates that the home and foreign goods are substitutive foe each other from the cross-halal level effect, which implies that the substitutes degree between the two goods depends on k and as well as on n in the model. It also implies that the slopes of the firms' reaction curves in a Bertrand industry are both positive in the price-setting stage, but negative in the quality-setting stage, contrary to the assumption made by previous studies.

Firms' halal certification compliance, which rely on their halal certification investments, are given by the level functions that are both strictly increasing and concave with respect to their halal certification investments and are shown respectively as:

$$\begin{aligned} h &= h(I), \qquad h'(I) > 0, \qquad h''(I) < 0 \\ h^* &= h^*(I^*), \qquad h^{*'}(I^*) > 0, \qquad h^{*''}(I^*) < 0 \end{aligned} \tag{4}$$

We assume that as the firms' halal certification investments rise, the $h(I)$ and $h^*(I^*)$ approach the finite limits h_L and h_L^*, respectively. In order to indicate the difference in the halal levels between the two firms, suppose that, given the firms' current halal levels, the home firm produce a good that is superior to that of the foreign firm in terms of halal

compliance[4]

$$\lim_{I\to\infty} = h_L, \qquad \lim_{I^*\to\infty} = h_L^* \qquad h_L(0) > h_L^*. \tag{5}$$

Furthermore, let us assume throughout this study that all markets for production factors including halal certification investments are perfectly competitive, hence, the firms can make their halal certification investment at a constant price, $P_I(P_{I^*}^*)$. The prices may differ according to the governments' interventions.

Based on the assumptions and functions mentioned above, firm profits in the developing and developed countries are, respectively, defined as

$$\pi = (p-c)\{A - ap + bp^* + \alpha h(I) - \beta h^*(I^*)\} - P_I I + sI \tag{6a}$$

$$\pi^* = (p^*-c^*)\{A - ap^* + bp + \alpha h^*(I^*) - \beta h(I)\} - P_{I^*}^* I^* + s^* I^* \tag{6b}$$

where $s(s^*)$ is the certification subsidy (tax if it is negative) that the developing country's government gives to its firm's halal certification investment. Firms act to maximise their profits, as defined in Equation (6a) and (6b). In the political decision stage the governments determine s and s^* to maximize their economic welfare. The countries' welfare are given respectively as:

$$W = \pi - sI \tag{7a}$$

$$W^* = \pi^* - s^* I^* \tag{7b}$$

The firms and governments play a three-stage game. In the first stage, the governments

[4]Differences in cost and quality levels between countries can be assumed with a difference in country classification, such as developing and developed countries (Ishii, 2013b; Zhou et al., 2002)

set their optimal halal certification investment subsidies to maximize their levels of economic welfare. In the second stage, the two firms determine their halal certification investments to maximize their profits. In the third stage, they decide on their prices so as to maximize their profits, non-cooperatively. We assume that the governments and firms act as followers in their decision-making stages. We adopt a backward-induction method to solve this three-stage game problem.

3 Price competition in the third stage

In the third stage, the firms decide on their prices so as to maximize their profits, defined by equation(6a) and equation(6b), which under the Bertrand-Nash equilibrium in the third stage is characterized by

$$A - 2ap + bp^* + \alpha h(I) - \beta h^*(I^*) + ac = 0 \tag{8a}$$

$$A - 2ap^* + bp + \alpha h^*(I^*) - \beta h(I) + ac^* = 0 \tag{8b}$$

where Equations (8a) and (8b) are the first-order conditions and reaction functions of the home firm and the foreign firm, respectively. Second order conditions for both firms are satisfied and the reaction curves for both firms are upward-sloping are given:

$$\pi_{pp} = \pi^*_{p^*p^*} = -2a < 0 \tag{9a}$$

$$\pi_{pp^*} = \pi^*_{p^*p} = b > 0 \tag{9b}$$

This means that prices are strategically complementary to each other. The Bertrand-Nash equilibrium in the third stage is stable as shown by equation(3), equation(9a), equation(9b), $\pi_{pp} + \pi^*_{p^*p^*} = -4a < 0$ and $\pi_{pp}\pi^*_{p^*p^*} - \pi_{pp^*}\pi^*_{p^*p^*} = 4a^2 - b^2 > 0$.

The industry equilibrium price for the home and foreign firms in the price-setting third stage are given, respectively, as

$$p = \frac{h^*(I)(\alpha b - 2a\beta) + h(I)(2a\alpha - \beta b) + 2a(A + ac) + b(A + ac^*)}{4a^2 - b^2} \tag{10}$$

$$p^* = \frac{h^*(I^*)(2a\alpha - \beta b) + h(I)(\alpha b - 2a\beta) + 2a(A + ac^*) + b(A + ac)}{4a^2 - b^2} \tag{11}$$

These equations, (10) and (11), show that prices depend on all the coefficients included in their demand functions and their product halal certification investments determined in the second stage, which in turn demonstrates that these prices eventually depend on the halal investment subsidies set by the respective governments in the first stage.

Futhermore, the effect of the firms' halal certification investment on the prices can be analyzed by equations (10) and (11) which yield

$$\frac{\partial p}{\partial I} = \frac{(2a\alpha - \beta b)h'(I)}{4a^2 - b^2} > 0, \quad \frac{\partial p}{\partial I^*} = \frac{h^{*'}(I^*)(\alpha b - 2a\beta)}{4a^2 - b^2} < 0,$$
$$\frac{\partial p^*}{\partial I^*} = \frac{h^{*'}(I^*)(2a\alpha - \beta b)}{4a^2 - b^2} > 0, \quad \frac{\partial p^*}{\partial I} = \frac{h'(I)(\alpha b - 2a\beta)}{4a^2 - b^2} < 0 \tag{12}$$

Therefore, equation(12) can be paraphrased as the following propositions:

Proposition 1. *An increase in the firm's halal certification investment of firm raises its own price, and reduces its rival's price, and vice versa.*

This proposition explains intuitively that a greater investment into the halal certification by a firm incurs an additional cost, but it gains a good reputation, hence increasing its product demand. These situations therefore combine to encourage the firm to raise its price. In contrast, a rise in the halal certification investment of a firm reduces demand for the product of the rival firm and hence results in a decline in its rival's price. Furthermore,

the above proposition also shows that any firm can raise its price whenever it improves its product halal level through greater halal certification investment.

Equation(12) also shows another feature of how a change in a firm's halal level affects the price competition between the firms. From Equation(12), we get

$$\frac{d(p-p^*)}{dI} = \frac{\alpha h'(I) + \beta h'(I)}{2a-b} > 0, \quad and \quad \frac{d(p-p^*)}{dI^*} = \frac{-\alpha h^{*'}(I^*) - \beta h^{*'}(I^*)}{2a-b} < 0 \qquad (13)$$

which produce the following proposition:

Proposition 2. *A rise in the product halal investment of the home (foreign) country's firm makes the price competition between firms less (more) intense, and vice versa.*

Based on this proposition, the firm in the home country may intentionally produce a good whose quality is superior to that of the foreign country's firm in order to wage an intensive price battle. In this case, choosing to produce a high-level high-price halal product is regarded as one of the business strategies available to the halal producer in a competitive international market.

4 Halal level competition in the Second Stage

In this section, we analyze the firms' product halal level choices and investigate how changes in the product halal investment subsidies provided by the home and foreign countries' governments affect their firms' halal product level and price competition. As both firms' halal level are endogenously determined through their halal certification investment decisions as shown by equations (4) and (5), their goods are both treated as variable-level commodities from an analytical point of view.

The firms act as followers in halal level competition and decide on their halal certification investment I and I^* so as to maximize their profits given their governments' halal investment

subsidies, their rivals' halal certification investment and their first-order conditions in the third stage. Thus, the Bertrand-Nash equilibrium conditions in the second stage for the firms' halal certification investment decisions are given by

$$(p-c)\{h'(I)(\alpha - b\frac{\beta}{2a})\} - P_I + s = 0 \tag{14a}$$

$$(p^*-c^*)\{h^{*'}(I^*)(\alpha - b\frac{\beta}{2a})\} - P^*_{I^*} + s^* = 0 \tag{14b}$$

where Equations (14a) and (14b) are the first-order conditions and reaction functions for the home and foreign firms, respectively. We assume that the second-order conditions are both satisfied: $\pi_{II} = (\alpha - \frac{b\beta}{2a})\{\frac{q''(I)}{2a} + (p-c)q''(I)\} < 0$ and $\pi^*_{I^*I^*} = (\alpha - \frac{b\beta}{2a})\{\frac{q^{*''}(I^*)}{2a} + (p-c)q^{*''}(I^*)\} < 0$. These conditions may affect the level of certification as had been shown in a study of quality advancement by Spencer and Brander (1983) .

Regarding equation (14a) in which the left-hand side is the marginal profit π_I of the home country's firm with respect to its halal certification investment I, a rise (fall) in I^* reduces(increases) π_I because it lowers (raises) the product price p of the home country's firm, as shown clearly in equation (12). Therefore, I must decrease(rises) to retain its first-order condition given by equation (14a)[5]. Similarly, it is shown that I and I^* also have a negative relationships in equation (14b). Intuitively, the firms' halal certification investment are strategically substitutive for each other.

Furthermore, equation (14a) and equation (14b) show that halal investment depends on production costs, c and c^*, and subsidies, s and s^*. Total differentiation of equation (14a)

[5]As in Ishii (2013b).

and equation (14b) with respect to I, I^*, s and s^* yields

$$\begin{aligned} \frac{\partial I}{\partial s} = \frac{-\pi^*_{I^*I^*}}{D} > 0, \frac{\partial I^*}{\partial s} = \frac{-\pi^*_{I^*I}}{D} < 0, \\ \frac{\partial I}{\partial s^*} = \frac{-\pi_{II^*}}{D} > 0, \frac{\partial I^*}{\partial s^*} = \frac{-\pi_{II}}{D} < 0 \end{aligned} \tag{15}$$

where, $D = \pi_{II}\pi^*_{I^*I^*} - \pi^*_{I^*I}\pi_{II^*} > 0$. We assume that the effect of halal investment on marginal profit dominates the cross-effect:

$$\pi^*_{I^*I^*} < \pi^*_{I^*I} < 0, \pi_{II} < \pi_{II^*} < 0 \tag{16}$$

Hence we may write the following proposition:

Proposition 3. *An increase in a government subsidy leads to a rise in the investment of its firm, but leads to a reduction in the investment of its rival's firm, and vice versa.*

From (14a)and (14b), we know that the halal investment are strategically substitutive for each other and their reaction function curves have negative slope. Therefore, a rise in a government subsidy shifts its firm's reaction function outward, which raises the investment of its firm and reduces the investment of its rival's firm, and vice versa.

The subsidy may affect the level of halal as follows:

$$\begin{aligned} \frac{\partial h}{\partial s} = h'(I)\frac{\partial I}{\partial s} > 0, \frac{\partial h^*}{\partial s} = h'^*(I^*)\frac{\partial I^*}{\partial s} < 0, \\ \frac{\partial h^*}{\partial s^*} = h'^*(I^*)\frac{\partial I^*}{\partial s^*} > 0, \frac{\partial h}{\partial s^*} = h'(I)\frac{\partial I}{\partial s^*} < 0 \end{aligned} \tag{17}$$

Hence we write the following proposition:

Proposition 4. *A rise in the subsidy of a country raises its firm's halal level but reduces its rival's halal level and vice versa.*

Combining (17) and (15) we see that the subsidy may provide an advantage to the firm

in the international market. Furthermore, we may check the intensity of the halal level competition by comparing those results.

The effect of a subsidy may be checked by differentiating p and p^* with respect to s and substituting equation (17) into the result, yield

$$\frac{\partial p}{\partial s} = \frac{(\alpha b - 2a\beta)h^{*'}_{I^*} I^*_s}{4a^2 - b^2} + \frac{(2a\alpha - \beta b)h_I I_s}{4a^2 b^2} > 0,$$
$$\frac{\partial p^*}{\partial s} = \frac{(\alpha b - 2a\beta)h^{*'}_{I^*} I^*_s}{4a^2 - b^2} + \frac{(2a\alpha - \beta b)h_I I_s}{4a^2 b^2} < 0 \quad (18)$$

Intuitively, these equations show that the subsidy increases the price of its firm and decreases the price of the rival in the price competition. As the subsidy pushes the investment of the firm, thus we know that it increases the halal level and lastly pushes the price up. We may conclude in the following proposition:

Proposition 5. *A rise in the subsidy level increases the price*

We may also conclude that the subsidy may increase the intensity of competition. However, subsidy by the home country and the foreign country have different effect on the domestic firm's price.

5 Optimal Halal Certification Policies in the First Stage

In the first stage, the government of home and foreign countries, respectively, determine the halal certification subsidy to maximize their economic welfare as defined by equation (7). Given the optimal points in the second and third stages, the first-order conditions for the

economic welfare maximization of the countries are given by

$$\frac{\partial W}{\partial s} = A(Mh_s + Nh_s^*) + sI_s \tag{19a}$$

$$\frac{\partial W^*}{\partial s^*} = B(Mh_{s^*}^* + Nh_{s^*}) + s^* I_{s^*}^* \tag{19b}$$

where, $A = b(p-c)$,$M = \dfrac{(\alpha b - 2a\beta)}{4a^2 - b^2}$, and $N = \dfrac{(2a\alpha - \beta b)}{4a^2 - b^2}$. These equations are the reaction functions of the countries in the first stage. We then derive the home and foreign optimal subsidy from (19a):

$$s = -\frac{A(Mh_s + Nh_s^*)}{I_s} \tag{20}$$

$$s^* = -\frac{B(Mh_{s^*}^* + Nh_{s^*})}{I_{s^*}^*} \tag{21}$$

The sign of the optimal subsidy depends on an equation which is extremely complicated. However, it yields an interesting argument where the subsidy or tax depends on the sign of the equation which subsequently depends on the marginal level effects.

Proposition 6. *The sign of s depends on the marginal level effects*

6 Concluding remarks

We have established a third-country trade model of an international duopoly that consists of firms producing halal products. The model introduces halal level functions that represent the correlation between the cost of investment and the halal level. Meanwhile, the demand function is constructed by incorporating the concept of "love of variety" which represents how consumers choose products based on the halal level.

The result shows that the halal certification investment increases (decreases) the home firm (foreign) price. This reflects the argument of Ishii (2013b) which states that a firm

may charge a higher price than its rival if the consumers appreciate the characteristic of the product. Furthermore, the study also shows that a subsidy by the government may give an advantage (disadvantage) to the home (foreign) firm. The subsidy also positively affects the halal level.

The model can be extended to analyze the cases of cooperative game. For instance, we may make an assumption that the firms form a strategic alliance in the second stage by jointly conducting their halal investment. Meanwhile, the governments may also implement strategic cooperation by jointly determining their policies.

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