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Social Value from Social Enterprise: An Incentive Design*

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Abstract We build a model of social enterprise that shows how social planners incentivize for-profit firms to pursue social welfare maximization. In our model, there is a social planner who provides an incentive program for an entrant firm to be a social enterprise. The amount of subsidy given to the social enterprise is proportional to the difference of a reference price and the price set by the entrant. The entrant firm decides whether to participate in the incentive program and maximize social welfare or to compete with an incumbent firm without any subsidy from the social planner. Several results emerge from our analysis. First, we identify conditions under which the entrant firm has an incentive to maximize social welfare by receiving the subsidy. The degree of such an incentive increases as the market size increases or the incumbent sells a low quality product. If the incentive program has the incumbent's monopolistic price as the reference price, it is more efficient than if the program has a competitive price as the reference price.

Keywords Incentive Design, Social Enterprise, Social Welfare, Sustainable Development, Business Strategy

JEL Classification A13, L31, P31

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1. INTRODUCTION

1.1. OVERVIEW

Social enterprise is commonly defined as a business that consists of both economic and social purposes.[1] The World Economic Forum and many experts claim that social enterprises play a crucial role in achieving the UN Sustainable Development Goals (henceforth, SDGs) efficiently (Gregory *et al.*, 2015).[2] Indeed, there are many social enterprises that contribute to the UN SDGs by solving social issues with business strategies. For example, Grameen Danone Foods is a social enterprise launched in 2006, which provides nutritious foods to children with micronutrient deficiencies in rural Bangladesh.[3] Another example is Nazava in Indonesia tackling water issues by providing affordable water filters.[4] As social enterprises pursue solutions for social problems, social welfare increases through efficient allocation, which leads to achievement of the UN SDGs.

In this paper, we investigate how social planners could induce social enterprises to enter the market and operate to maximize social welfare. Through the examples, it is clear that some social enterprises deal with social issues to generate social impact by cutting prices. Hence, the change in prices could increase the affordability for low-income consumers, consumer surplus, and social welfare, which could be referred to as a social enterprise's social value. By lowering prices, the profit for the firm would decrease while the consumer surplus increases. Compensation for the loss of a firm might be needed to shift a for-profit firm to a social enterprise. If a sufficient amount of subsidy is provided to the

[1] Although there are many definitions of social enterprise that still are discussed, the common definition of social enterprise is a business venture that not only is enterprise-oriented but also generates social value by tackling social problems. In this paper, we employ the definition of social enterprise that the European Commission established in 2011. Social enterprise is an operator in the social economy, whose main goal is to have a social impact (Alter, 2006).

[2] To protect the environment and reduce poverty with economic growth, the 2030 Agenda for Sustainable Development was adopted by all United Nations member states in 2015. The seventeen SDGs are proposed as the center of the agenda. The main purpose of the UN SDGs is to end deprivations in different fields such as education, equality, economics, and the environment (Sources: `https://sdgs.un.org/goals` and `https://blogs.adb.org/blog/how-social-enterprises-can-help-us-meet-sdgs`).

[3] Grameen Danone reduces poverty by serving yogurt (Shokti +) that includes key nutrients at a low price, 6 BDT (0.071 USD), for children who cannot otherwise afford the food (Source: `https://www.danone.com/integrated-annual-report-2019/sustainable-projects/danone-communities-grameen.html`).

[4] Nazava's water filters are distributed at 87.5% off, which is the general price of potable water in Indonesia (Source: `https://www.nazava.com`).

firm, it would be willing to behave like a socially concerned firm.

However, when there are two firms in the market, it is unclear which price must be a reference price to calculate compensation. Consider a potential duopoly market in which one firm is an incumbent market monopolist and maximizes its profit. Suppose that a new firm enters the market pursuing social welfare maximization. In this regard, the entrant could be a social enterprise.

Two factors should be taken into account when implementing a subsidy program for social enterprise. First, the effective amount of subsidy must be carefully calculated. The amount of incentive might not exceed the increase of total consumer surplus and might not be less than the loss to the firm that transfers to social enterprise. Second, more importantly, the reference price to provide subsidy is uncertain. Specifically, since there are two firms, two possible prices could be under consideration: one is the monopolistic price chosen by the incumbent firm before the presence of the entrant, and the other is the equilibrium price under the competition of two firms. Depending on the choice of a reference price, the amount of the subsidy changes, and the effectiveness of a subsidy program changes ultimately.

In our model, there are two firms in the market, an incumbent and an entrant. They compete in the market as profit maximizers unless there exists an incentive to shift to a social enterprise. We assume that if there is an incentive to be a social enterprise, the social enterprise maximizes its profit and consumer surplus. This model captures the existence of such an incentive and the amount of subsidy under an asymmetric intrinsic value. Through the analysis of equilibrium, we shed light on how social planner promotes the entrance of a social enterprise into the market.

Several results emerge from our analysis. First, we identify conditions under which the entrant firm has an incentive to maximize social welfare by receiving the subsidy. The degree of this incentive increases as the market size increases or the incumbent sells a low quality product. If the incentive program has the incumbent's monopolistic price as the reference price, it is more efficient than if the program has a competitive price as the reference price.

1.2. RELATED LITERATURE

There has been a growing body of literature related to the relationship between social enterprise and the achievement of the UN SDGs. Littlewood and Holt (2018) propose a conceptual framework that illustrates social enterprises can contribute to the UN SDGs throughout their value chains. Additionally, global social enterprises can achieve multiple SDGs simultaneously. Borzaga

and Defourny (2013) also elaborate how a community-based system leads to sustainable development. They present a conceptual model that demonstrates social enterprise in developing countries generates poverty alleviation and environmental sustainability and finally leads to sustainable development.

With respect to the UN SDGs, social enterprise is a key actor in every sector including the environment. The sustainability of social enterprise needs to be guaranteed to achieve SDGs. Bugg-Levine *et al.* (2012) explain that many social enterprises suffer from financial problems because they have a significant amount of social returns, but less economic return (Rha, Kim and Park, 2018). Because social return cannot be totally captured by market price, the proper measurement of social value from social enterprise and rewards of social impact are essential to sustain social enterprise. Kim (2009) illustrates the role of the social planner is crucial in order to boost the development of social enterprises in Korea. Kim and Lee (2018) also show that the current subsidies for social enterprise, especially support for wages, are not optimal, which needs to be improved.

In theoretical perspectives, previous literature on social enterprise has primarily analyzed it using the Cournot competition. Fraja and Delbono (1989) find that a public firm that is purely welfare-maximizing is not optimal in terms of social welfare. Matsumura (1998) determines that partial privatization that maximizes a weighted average of welfare and profit is optimal for social welfare in a mixed duopoly. Beckmann (2018) and Hong and Ju (2016) assess the impact of social enterpise and find that social enterprise increases social welfare in mixed oligopoly. Cho and Lee (2019) examine the optimal number and output of social enterprises to maximize the social welfare. However, there are a few studies on mixed duopoly with price competition. Kopel (2015) and Barcena-Ruiz (2007) analyze the mixed duopoly market with price competition. Kopel (2015) focuses on the strategic incentives to manager, but in Barcena-Ruiz (2007), firms set prices simultaneously.

The motivation of this paper is to analyze the market with price competition. Since a social enterprise serving social goods and services usually discounts the price to improve affordability, price competition seems to be appropriate, which is not mainly analyzed in the above papers. In addition, the social planner–the policymaker–is essential to promote the development of the social enterprise and the current approach needs to be changed. We focus on the incentives needed to lead the firm to act as a social enterprise though an optimal pricing strategy for the entrant firm, rather than analyzing the mixed duopoly competition between the for-profit firm and the social enterprise.

The rest of the paper is organized as follows. Section 2 builds models of

social enterprise with real-world examples. In Section 3, we analyze the model under three different scenarios. Then, in Section 4, we gather implications of firm behavior, market outcomes, and social welfare. Section 5 concludes. Since theoretical results are self-evident from the main text, we omit proofs.

2. MODEL

2.1. BENCHMARK MODEL: MONOPOLY

We first present a benchmark model of a monopoly. A standard monopoly market with linear demand is illustrated by Figure 1. In the figure, the equilibrium price chosen by the monopolist is denoted by p^m. Suppose that if the monopolistic firm changes to p^s, the total consumer surplus increases by the amount of $(a)+(b)$. However, in the perspective of the firm, compared to the original profit, the difference in profit is $(d)-((a)+(e))<0$. Therefore, any price change from p^m decreases the monopolist's profit, and the compensation for transition to a social enterprise is required to increase consumer surplus.

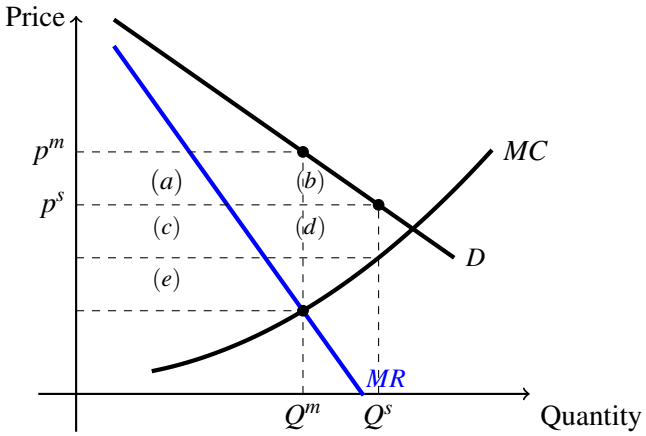

Figure 1: Market for a firm

The social planner can compensate for the firm's loss by providing a subsidy, and it may incentivize the monopolist to decrease the price from the monopolistic price p^m if the amount of the subsidy is larger than the loss of the firm. One possible subsidy mechanism is to provide a subsidy proportional to the difference between the prices as

$$\text{the amount of subsidy} = \max\{\alpha(p^m - p^s), 0\},$$

where $\alpha > 0$. Depending on choice α, the subsidy might exceed the loss of the firm, and also be less than the increase of the consumer surplus.

However, when there are two firms operating in the market, another problem emerges. Specifically, consider the situation in which one incumbent firm was a monopolist of the market, and a new entrant firm enters the market. Then, for the same subsidy program, other than the price of the monopolistic price chosen by the incumbent, the social planner may choose the predicted equilibrium price under duopoly competition as the reference price. In the following subsection, with a consideration of the reference price, we develop a simple model of two firms and evaluate the effectiveness of different price choices as subsidy mechanisms to derive social value from social enterprise.

2.2. SETUP: LINEAR HOTELLING MODEL

Our model is a variant of the linear hotelling model (Hotelling, 1929). Consumers are heterogeneous and represented by their position $x \in [0,1]$, which is assumed to be uniformly distributed in $[0,1]$. We normalize the population mass as 1. There are two firms in the market, denoted by firm 1 and firm 2, and two firms provide two different goods, respectively. Firm 1 is an incumbent firm that is located at 0; firm 2 is an entrant that is located at 1. Each firm maximizes its own profit by choosing its price; we denoted p_i as the price set of firm $i \in \{1,2\}$. For simplicity, we assume that both firms produce at zero marginal cost.

When a consumer at location x purchases the product from firm i, she obtains a utility of $u_i = v_i - p_i - x$, where v_i is the intrinsic value of firm i's product, p_i is the price of firm i's product, and x is the linear transportation cost.[5] We assume that firms have asymmetric intrinsic values, and we assume that the intrinsic value of firm 2's product, v_2, is in proportion to the value of the incumbent firm as $v_2 = \gamma v_1$ for some $\gamma \in [0,1]$.[6] Since v_1 is assumed to be larger than 1, each consumer purchases the product from at least one firm. Throughout the paper, we refer to the condition $v_1 \geq 1$ as the full market coverage condition.

The size of the demand for each firm is represented by a consumer located at a threshold location. This consumer is indifferent between the two products.

[5]For simplicity, we assume a simple linear transportation cost, but one can easily generalize this part for a quadratic convex cost, for example.

[6]If the value of the entrant firm is greater than that of the existing firm, there is no reason to support the entrant firm since it is already competitive. Furthermore, social enterprises provide basic social goods and services for low-income groups, so the quality of goods and services might be fundamental. In this paper, we only consider the smaller intrinsic value of entrant firm.

Hence, as a function of p_1 and p_2, the size of demand for firm i's product is

$$D_i(p_i, p_{-i}) = \frac{1}{2}(w_i - w_{-i}) + \frac{1}{2} = \frac{1}{2}\Delta w_i + \frac{1}{2},$$

where $w_i = v_i - p_i$ and $\Delta w_i = w_i - w_{-i}$. The profit for firm i is $\pi_i(p_i, p_{-i}) = p_i D_i(p_i, p_{-i})$, and the surplus for the consumers purchasing the product from firm i is $CS_i = \frac{1}{2} w_i D_i$.

2.3. DISCUSSION OF THE MODEL: REAL-WORLD EXAMPLES

Among the various types of social enterprise, this model analyzes the social enterprise that provides goods horizontally differentiated from the existing incumbent's product. For some consumers, the incumbent's good might not the best choice because it does not reflect their preference to some extent. The entrant's product with additional attributes can be the better option for those consumers in line with their preference. There are few examples suitable for the description of our model.

The stories of upcycling firms fit into our model.[7] There are two upcycling firms in the market; one is a normal firm (located at 0), the other is an upcycling firm (located at 1). The concern about the environment represents the heterogeneity of consumers in the market. Some consumers concerns about environmental impact while purchasing items, which is represented by x. In a monopoly market, there is only one firm (firm 1) that does not care about the environment, so consumers only can purchase the product of firm 1 regardless of their preferences. However, when upcycling firm (firm 2) enters the market, consumers have another option to purchase the environmentally friendly products. Since the products of upcycling are made by recycling of waste, the intrinsic value of the entrant firm could be smaller than that of the incumbent firm.

Another example is *Bottle Factory*, a coffee franchise in South Korea. This cafe is operated with zero disposable waste. Typically, a huge amount of disposable waste–such as cups and straws–are used in the cafe, which pollutes the environment. Bottle Factory is an eco-freindly cafe that reduces waste to protect the environment. In this zero-disposable-waste cafe, consumers can replace the disposable cups with a tumbler and do not use straws in order to make zero waste. In this way, consumers who have an environmental concern can be satisfied by visiting the cafe.[8]

[7] One can find specific examples of upcycled material from Southwest Airlines in line with sustainable development goals (Source: `community.southwest.com/t5/Blog/Repurpose-with-Purpose/ba-p/62382`).

[8] Source: `www.greenkorea.org/activity/living-environment`.

3. ANALYSIS

3.1. COMPETITION

We first analyze the scenario in which two firms are maximizing their profits by setting competitive prices. In our setting, the best response functions are

$$\text{best response function for firm 1:} \quad BR^1(p_2) = \frac{1}{2}p_2 + \frac{1}{2}(v_1 - v_2 + 1),$$
$$\text{best response function for firm 2:} \quad BR_1^2(p_1) = \frac{1}{2}p_1 + \frac{1}{2}(v_2 - v_1 + 1).$$

In the above expressions, BR^1 is the best-response function of the incumbent, and BR_1^2 is the best-response function of the entrant under the first scenario. Figure 2 illustrates the functions. The resulting equilibrium is represented by A in the figure, where the equilibrium prices are

$$(p_1^*, p_2^*) = \left(1 + \frac{1}{3}(v_1 - v_2), 1 - \frac{1}{3}(v_1 - v_2)\right). \tag{1}$$

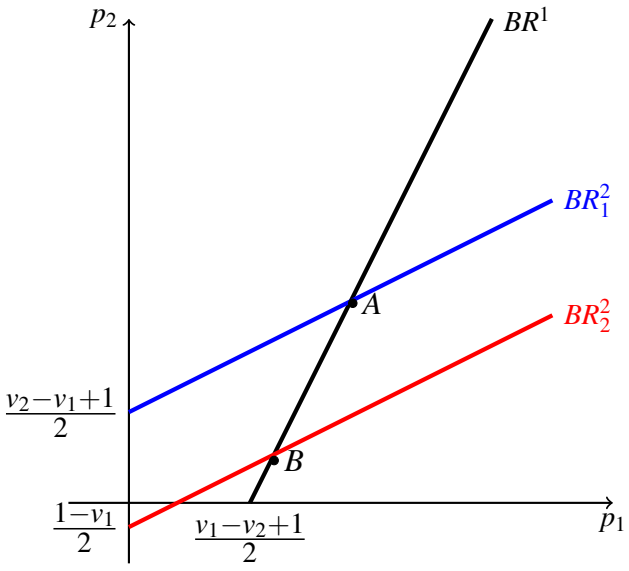

Figure 2: Illustration of best response functions under difference scenarios

We now consider the case in which the entrant, as a social enterprise, deals with consumer surplus or social welfare when creating social impact. We take

a conservative perspective that the social contribution of the entrant is measured by the sum of its profit and the *partial* consumer surplus when purchasing the product from the entrant (Rha, Kim and Park, 2018).[9] Specifically, we assume that firm 2 maximizes $\pi_2 + CS_2$. Thus, the best response function of the entrant now becomes

$$BR_2^2(p_1) = \frac{1}{2}p_1 + \frac{1}{2}(1 - v_1), \tag{2}$$

and it is denoted by the red line in Figure 2. The new equilibrium is denoted by B in the figure, where the equilibrium prices are

$$(p_1^*, p_2^*) = \left(1 + \frac{1}{3}(v_1 - 2v_2), 1 - \frac{1}{3}(v_1 + v_2)\right).$$

From the above analysis, when firm 2 enters the market as a social enterprise, both p_1 and p_2 are lower than levels when the entrant is a for-profit firm. Thus, it is clear that the social enterprise increases consumer surplus. Hence, if there is a scheme that leads firms to perform altruistically, the consumer surplus would increase more in the market with social enterprises. In this section, we elicit an incentive given by a benevolent social planner that makes firms act as a social enterprise.

We consider the situation under which a social planner grants a subsidy for a social enterprise in accordance with the difference of price between two firms, $\alpha(p^R - p_2)$ with $\alpha > 0$. p^R as the reference price, and we consider two possible reference prices: (i) the price of incumbent firm without the presence of the entrant, and (ii) the equilibrium price under duopoly competition. In the following subsections, we analyze the effects of each price sequentially.

3.2. BASED ON MONOPOLY PRICE

We here consider the case when the reference price is chosen as the monopoly price of the market. In this scenario, the best response function of firm 2 with a subsidy is

$$BR_3^2(p_1) = \frac{1}{2}p_1 + \frac{1}{2}(v_2 - v_1 + 1) - \alpha. \tag{3}$$

[9] In previous papers, the objective function of social enterprise is set as a weighted average of profit and social welfare. Nonetheless, social enterprise suffers from a financial problem, because economic return is less than social return. In order to sustain business for the long term as a social enterprise, a firm might need to consider economic value as well as social value. Therefore, we assume that a firm needs to put equal weight on economic value and social value.

Note that the amount of the subsidy, which is part of the firm's profit, also matters for the best-response function.

If $\alpha = \frac{1}{2}v_2$, subsidies can lead the a profit maximizing firm to behave as partial social welfare maximizing firm. As the value of the incumbent firm increases, α should increase so as to match the socially desirable outcome. Note that since v_2 is assumed to be γv_1, we also have $\alpha = \frac{1}{2}v_2 = \frac{\gamma}{2}v_1$. Hence, the decision of whether firm 2 receives the subsidy depends on the size of the market, which in turn depends on the intrinsic value of the incumbent firm (i.e., v_1). For firm 2, based on the market size, it would decide whether to compete with the incumbent firm for profit maximization or to receive the subsidy by decreasing its price to the socially desirable level.

When $\alpha = \frac{1}{2}v_2$, the profits that firm 2 gets at the equilibrium price in two cases are

$$\text{profit under competition:} \quad \frac{1}{2}\left(1-\frac{1}{3}(1-\gamma)v_1\right)^2, \tag{4}$$

$$\text{profit with subsidy program:} \quad \frac{1}{2}\left(1-\frac{1}{3}(1-\gamma)v_1\right)^2 - \frac{\gamma}{6}v_1(2\gamma v_1 - \frac{7}{3}v_1 + 1). \tag{5}$$

The entrant firm 2 will determine whether to get the subsidy if and only if the profit with the subsidy program is higher than the profit under competition. By subtracting (5) from (4), the entrant participates in the subsidy program if and only if γ and v_1 satisfy

$$3-(7-6\gamma)v_1 \leq 0. \tag{6}$$

Otherwise, if γ and v_1 do not satisfy the above inequality, then the entrant firm does not participate in the subsidy program. The following proposition summarizes:

Proposition 1. *Suppose that the amount of the subsidy is $\frac{1}{2}v_2(\frac{1}{2}v_1 - p_2)$. Then, the entrant firm participates in the subsidy program if and only if*

$$v_1 \geq \frac{3}{7-6\gamma}.$$

Define two thresholds of v_1 and γ that determine the entrant's behavior:

$$\underline{v}(\gamma) = \frac{3}{7-6\gamma} \quad \text{for } \gamma \in [0,1],$$

$$\overline{\gamma}(v_1) = \frac{7v_1-3}{6v_1} \quad \text{for } v_1 \geq 1.$$

For given γ, v_1 can be interpreted as the market size. Thus, Proposition 1 can be restated as if other things are equal, the entrant participate in the subsidy program if and only if the market size is larger than a threshold $\underline{v}$. Similarly, for a given $v_1 \geq 1$, γ measures the relative intrinsic value of the entrant's product. Thus, it follows that the entrant participates in the subsidy program if its product is less valuable than threshold $\overline{\gamma}$. The following proposition formalizes:

Corollary 1. *Suppose that the amount of the subsidy is* $\frac{1}{2}v_2(\frac{1}{2}v_1 - p_2)$. *Let* $\gamma \in [0,1]$ *be given. Then, the entrant participates in the subsidy program if and only if* $v_1 \geq \underline{v}(\gamma) = \frac{3}{7-6\gamma}$. *Suppose that* $v \geq 1$ *is given. Then, the entrant participates in the subsidy program if and only if* $\gamma \leq \overline{\gamma}(v_1) = \frac{7v_1-3}{6v_1}$.

3.3. BASED ON MARKET EQUILIBRIUM PRICE

We now consider the case in which the reference price is the equilibrium price under duopoly competition. In this case, the best response of firm 2 with subsidy is

$$BR_4^2(p_1) = \frac{1}{2}p_1 + \frac{1}{2}(v_2 - v_1 + 1) - \frac{1}{2}\alpha. \tag{7}$$

Note that compared to the best response function (3), the entrant's best response is higher in the amount of $\frac{1}{2}\alpha$. This observation is intuitive as the amount of subsidy under the current case is smaller than the amount of subsidy under the previous case in which the reference price is the monopoly price. Thus, to maximize the profit, the entrant sets a higher price.

Consequently, to incentivize the entrant to choose the socially desirable price, $\alpha = v_2$ is required. Then, the profits that firm 2 obtains at the equilibrium price in the two cases are

$$\text{profit under competition:} \quad \frac{1}{2}\left(1 - \frac{1}{3}(1-\gamma)v_1\right)^2,$$

$$\text{profit with subsidy program:} \quad \frac{1}{2}\left(1 - \frac{1}{3}(1-\gamma)v_1\right)^2 - \frac{\gamma}{18}v_1\left(3 - 13v_1 + 9\gamma v_1\right).$$

The entrant firm will determine whether to get the subsidy if and only if the profit with the subsidy program is higher than the profit under competition, which results in the following condition:

$$3 - (13 - 9\gamma)v_1 \leq 0. \tag{8}$$

Otherwise, if γ and v_1 do not satisfy the above inequality, then the entrant chooses not to get the subsidy and pursue profit maximization under competition. The following proposition summarizes:

Proposition 2. *Suppose that the amount of the subsidy is* $v_2(1+\frac{1}{3}(v_1-v_2)-p_2)$. *The entrant firm participates in the subsidy program if and only if*

$$v_1 \geq \frac{3}{13-9\gamma}.$$

Since $\gamma \in [0,1]$, the maximum value of the right-hand side of the above inequality is $\frac{3}{4}$. This number is strictly less than the minimum value of v_1 for the full market condition. This means that whenever the incumbent firm covers the full market, firm 2 chooses to be a social enterprise with subsidy. This firm behavior is very different from the scenario in which the reference price is chosen as the monopoly price. The following corollary summarizes:

Corollary 2. *Suppose that the amount of the subsidy is* $v_2(1+\frac{1}{3}(v_1-v_2)-p_2)$. *If the full market condition is satisfied as* $v_1 \geq 1$, *then the entrant participates in the subsidy program.*

4. IMPLICATIONS

4.1. FIRM BEHAVIOR

Figure 3 summarizes the entrant decisions under a different choice of reference prices for the subsidy program. The black solid line represents condition (6), and the red solid line represents condition (8). Under each choice of reference price, if (v_1, γ) is located to the right below the corresponding line, then the entrant participates in the program and the socially desirable prices are chosen by the firms.

Note again that under the full market coverage condition (i.e., $v_1 \geq 1$), the entrant always acts as a social enterprise and receives the subsidy when the reference price is chosen as the equilibrium price under competition. However, when the reference price is the monopoly price of the incumbent, the entrant may decide to compete without subsidy.

4.2. MARKET OUTCOMES

We here compare market outcomes under the scenario in which the entrant behaves as a for-profit firm and the scenario in which the entrant behaves as a

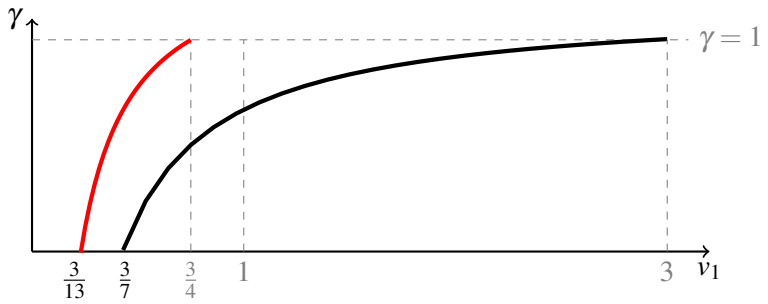

Figure 3: Illustration of the firm's behavior

social enterprise with subsidy. Table 1 summarizes the differences of each firm's profit, consumer surplus, and social welfare in those scenarios. When an outcome is positive, it means that it is larger when the entrant behaves as a social enterprise than when the firm competes with the incumbent without subsidy from the social planner. Note that for the entrant, the profit excludes the amount of the subsidy from the social planner. There are two different outcomes indicating consumer surplus. Consumer surplus[1] measures the consumer surplus from the consumers who purchase the product from the incumbent, and Consumer surplus[2] measures the consumer surplus from the consumers who purchase the product from the entrant. All the market outcomes are independent of a particular choice of reference price by the social planner.[10]

Outcome	Difference
Profit of the incumbent	$\frac{1}{18}v_2(3v_2-2v_1-6)$
Profit of the entrant without subsidy	$\frac{1}{18}v_2(-3v_2+v_1-3)$
Consumer surplus[1]	$\frac{1}{36}v_2(-3v_2-v_1+6)$
Consumer surplus[2]	$\frac{1}{36}v_2(6v_2-v_1+3)$
Partial social welfare	$\frac{1}{36}v_2(v_1-3)$
Total social welfare	$\frac{1}{36}v_2(3v_2-4v_1-9)$

Table 1: Summary of profits and social welfare

Among the listed outcomes, one particularly relevant question is whether

[10]This observation originates from the fact that in any choice of the reference price, since α is chosen so as to ensure the resulting price of the incumbent is socially desirable, the resulting market outcome does not depend on the choice of the reference price.

consumers who purchase from the entrant get a higher utility under the presence of the social enterprise program. As shown in Table 1, the amount of the social surplus of those consumers is $\frac{1}{36}\gamma v_1((6\gamma-1)v_1+3)$, and it is positive if and only if

$$(6\gamma-1)v_1+3\geq 0. \tag{9}$$

Equation (9) holds if $\gamma\geq\frac{1}{6}$ for any $v_1\geq 1$. In other words, if the relative quality of the entrant firm's product is higher than a certain level, then the surplus of the consumers who purchase from the entrant increases. However, when the subsidy program generates a higher social surplus for those consumers only when $\gamma\leq\frac{1}{6}$, then $v_1\leq\frac{3}{1-6\gamma}$.

We examine a similar analysis for the surplus of the consumers who purchase the item from the incumbent. From Table 1, the surplus is positive if and only if

$$(3\gamma+1)v_1-6\leq 0.$$

Therefore, if the value of the incumbent firm is less than $\frac{3}{2}$, then the consumer surplus increases under the subsidy program. Notably, if the value of the incumbent firm is too big as $v_1>6$, the consumer surplus decreases when the social enterprise enters the market.

We finally analyze the sum of the consumer surplus. The difference of the total consumer surplus under the two scenarios is

$$\text{Consumer surplus}^1+\text{Consumer surplus}^2=\frac{1}{36}\gamma v_1(3\gamma v_1-2v_1+9),$$

which is positive if and only if $(2-3\gamma)v_1-9\leq 0$. Consequently, there exists a range where the total consumer surplus becomes higher under the subsidy program.

The following proposition summarizes discussions about the consumer surplus:

Proposition 3. *Under the full market condition $v_1\geq 1$, the following holds:*

(a) The surplus of the consumer purchasing an item from the entrant is higher under the subsidy program if and only if $(6\gamma-1)v_1+3\geq 0$.

(b) The surplus of the consumer purchasing an item from the incumbent is higher under the subsidy program if and only if $(3\gamma+1)v_1-6\leq 0$.

(c) The total consumer surplus is higher under the subsidy program if and only if $(2-3\gamma)v_1-9\leq 0$.

Moreover, the set of parameters (v_1,γ) of each of the above conditions is not empty.

4.3. SOCIAL WELFARE

In social planner perspectives, the cost of a subsidy program is the amount of the subsidy (i.e., $\alpha(p^R - p^2)$ in the equilibrium. On the other hand, the benefit corresponds to the total consumer surplus (i.e., the sum of Consumer surplus[1] and Consumer surplus[2]). When the reference price is chosen as the incumbent's monopolistic price, the difference between the benefit and cost is $\frac{1}{36}\gamma v_1(9\gamma v_1 - 14v_1 + 9)$. In Figure 4, the black dashed line represents the values of (v_1, γ) in which the benefit and the cost are the same. When, (v_1, γ) is located at the north-west side of the line, then the benefit is higher than the cost. Note that if the market size is larger than $\frac{9}{5}$, then the social cost of the subsidy is always strictly greater than the benefit from an increased consumer surplus.

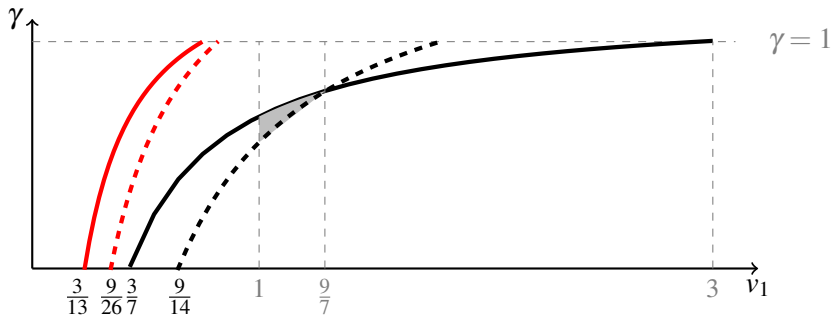

Figure 4: Implication for firms and social planner

When the reference price is set as the competitive price, the difference is $\frac{1}{36}\gamma v_1(15\gamma v_1 - 26v_1 + 9)$. In Figure 4, the red dashed line represents the values of (v_1, γ) in which the benefit and the cost are the same. If (v_1, γ) is located at the north-west side of the line, then the benefit is higher than the cost.

We now explain that there is a set of parameters (v_1, γ) in which it is better for the social planner to provide a subsidy to the entrant and the entrant receives the subsidy and behaves as a social enterprise. In addition, the set has a strictly positive measure as illustrated by Figure 4. In the figure, the solid lines replicate the threshold lines in Figure 3; on the south-east side of each line, it is more profitable for the entrant to receive the subsidy and operate as a social enterprise.

If the social planner provides the subsidy by reflecting the equilibrium price of the incumbent firm, there exists a set of (v_1, γ) in which the entrant decides to receive the subsidy and the social planner would like to give the subsidy, where $v_1 \in \left[\frac{3}{13}, \frac{9}{26}\right]$. However, any point in this region of (v_1, γ) does not satisfy the full market condition $v_1 \geq 1$.

When the social planner reflects the monopoly price of the incumbent firm, the black solid and dashed lines cross at a point, where $v_1 = \frac{9}{7}$. In Figure 4, the gray region represents the set of (v_1, γ) where both the social planner and the entrant get a higher payoff by running and participating in the subsidy program that establishes the monopoly price as the reference price. In other words, this corresponds to the case in which the market size is slightly higher than the full market coverage condition, and the entrant's relative quality is moderately high. The following proposition summarizes:

Proposition 4. *Suppose that the full market condition holds. Then, if the reference price is chosen as the competitive price, then there is no region in which the increase of the amount of subsidy is greater than the increase of the consumer surplus. If the reference price is chosen as the monopoly price, then (i) there is a set of parameters* (v_1, γ) *in which the increase of the consumer surplus is strictly greater than the increase of the amount of the subsidy, and (ii) the entrant receives the subsidy and behaves as a social enterprise.*

In general, the monopolistic price is higher than the competitive price. In other words, it is more efficient when the social planner sets the higher reference price with a monopolistic price. In Figure 4, however, there is a tension that it could fail in incentivizing an entrant firm to be a social enterprise despite setting a higher reference price.

5. CONCLUDING REMARKS

With the large contribution of social enterprises to achieving the UN SDGs, it is necessary to encourage social enterprises to enter the market. This paper examines whether firms have an sufficient incentive to increase social welfare with a theoretical approach. Specifically, this model focuses on social enterprises that provide social goods and services at a low price. Consequently, the incentive that induces a firm to act as a social enterprise exists under the appropriate market size. The amount of the subsidy increases as the market size increases. Furthermore, when a subsidy is granted according to the difference in prices between two firms, it is efficient to reflect the fixed monopoly price of the incumbent firm.

There might be an issue whether the social planner recognizes the reference price correctly in reality. When the entrant firm enters an existing market monopolized by an incumbent firm, it is natural that the social planner uses the price set by the incumbent before the entrance. In this paper, the reference price with the monopolistic price induces an efficient outcome. To select a reference price,

the social planner need not identify the competitive price with the entrance of a new firm. Indeed, Social Progress Credit (SPC) is a methodology that measures the social value with the reference price, which is the monopolistic price before the entrance.

Rha, Kim and Park (2018) suggest SPC to quantify the social value from social enterprises. SPC is an incentive for social enterprise which is in proportion to not-rewarded social impact from a social enterprise. SPC assesses uncompensated social impact from two perspectives: market price and costs. Monetary compensation for the difference of prices or costs is expected to eliminate the market failure of social enterprises. Hong and Ju (2019) examine the empirical effect of SPC and determine that the longer the period in which social enterprises are granted SPC, the more social value is created.

From an entrant business perspective, a business can plan the strategy depending on the market size and subsidy existence. If the power of monopoly is huge, the firm might not have the advantage to compete in the market as a for-profit firm. At that time, competing as a social enterprise can be a strategy for the firm with the appropriate subsidy. In addition, the optimal subsidy exists with no additional concerns from firms. The results show that an efficient subsidy exists in a conservative approach, where the social value that social enterprises create is assumed to be the same as consumer surplus in the market. When the positive externality of social enterprises such as environmental improvement is concerned, a social planner is willing to reward social enterprises with more subsidy. If the social planner encourages the firm to be a social enterprise through this subsidy, the number of social enterprises would increase in the market; finally, they can commit to achieving many SDGs by improving social welfare.

One salient extension would be to consider not features of vertical differentiation of the products as well as horizontal differentiation in the current model. In reality, some social enterprises provide goods for low-income citizens that have essential functions only. For instance, in South Korea, a hearing aid is approximately 1,500,000 KRW, which is too expensive to purchase by low-income consumers who need the hearing aid. The *Delight Hearing Aid*, a social enterprise established in 2010, produced the hearing aid at a lower price, 340,000 KRW. The Delight measured the size and depth of ears and standardized the sizes of the hearing aid instead of customizing it for each consumer. Standardization substantially decreased the production cost; consequently, the company can supply the products at a low price compared to the existing product. To analyze the effects of a subsidy program, it is worth considering this extension by incorporating Skaked and Sutton (1982) and Shaked and Sutton (1983).

A. ADDITIONAL TABLE

Table 2 summarizes market outcomes. For each outcome, by subtracting the quantity of the scenario under social enterprise from the maximizing profit, the quantities in Table 1 in the main text are obtained.

Outcome	Maximizing profit	Social enterprise
π_1	$\frac{1}{2}(1+\frac{1}{3}(v_1-v_2))^2$	$\frac{1}{2}(1+\frac{1}{3}(v_1-2v_2))^2$
π_2	$\frac{1}{2}(1-\frac{1}{3}(v_1-v_2))^2$	$\frac{1}{2}(1-\frac{1}{3}(v_1+v_2))(1-\frac{1}{3}(v_1-2v_2))$
CS_1	$\frac{1}{4}(-1+\frac{1}{3}(2v_1+v_2))(1+\frac{1}{3}(v_1-v_2))$	$\frac{1}{4}(-1+\frac{2}{3}(v_1+v_2))(1+\frac{1}{3}(v_1-2v_2))$
CS_2	$\frac{1}{4}(-1+\frac{1}{3}(v_1+2v_2))(1-\frac{1}{3}(v_1-v_2))$	$\frac{1}{4}(-1+\frac{1}{3}(v_1+4v_2))(1-\frac{1}{3}(v_1-2v_2))$
SW_2	$\frac{1}{4}(1-\frac{1}{3}(v_1-v_2))(1-\frac{1}{3}(v_1-4v_2))$	$\frac{1}{4}(1-\frac{1}{3}(v_1-2v_2))^2$
SW	$\frac{1}{36}(5v_1^2-10v_1v_2+5v_2^2+9v_1+9v_2+18)$	$\frac{1}{36}(5v_1^2-14v_1v_2+8v_2^2+9v_1+18)$

Table 2: Summary of profits and social welfare

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