Chapter 8
Political Economic Analysis of Privatization

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Abstract This chapter analyzes the effect of domestic lobbying on the optimal degree of privatization and social surplus in a closed mixed oligopoly model and an extended two-country model. We find that lobbying activity leads to overprivatization in a closed economy and may improve social welfare in a two-country economy. When each country's benevolent government determines the optimal privatization level, the privatization level always leads to underprivatization. This means an open trade policy leads to underprivatization. However, our results show that overprivatization may also exist in an open economy.

8.1 Introduction

This chapter analyzes the effect of domestic lobbying on the optimal degree of privatization and social surplus in a mixed oligopoly model. Matsumura (1998) found that "neither full privatization (the government does not hold any shares) nor full nationalization (the government holds all of the shares) is optimal under moderate conditions." Thus, the government can achieve the optimal allocation by determining the privatization ratio as in Chap. 1. However, previous studies have not explained why the optimal privatization policy does not proceed if the above circumstance prevails. We argue that lobbying activity is one of the reasons for this problem. To our knowledge, no studies to date analyze a mixed oligopoly with the effect of lobbying activity from a theoretical perspective. From an empirical point of view, as in Ang and Boyer (2007), special interest groups in public firms lobby politicians and political parties and induce desirable policies via campaign contributions.

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Except for the studies of mixed oligopoly, numerous studies have investigated the effect of lobbying activity. Grossman and Helpman (1994) analyzed the effect of lobbying on trade protection using a small-country model and found that trade protection, or the optimal tariff rate, should be higher in industries characterized by lobbying. Goldberg and Maggi (1999) verified the same by empirical investigation. Moreover, Kagitani (2008) extended the lobbying model to a strategic trade policy.[1]

Based on these considerations, we analyze the effect of lobbying activity on privatization policy and social welfare using a closed model and an extended two-country model. We find that lobbying activity leads to overprivatization in a closed economy and may improve social welfare in a two-country economy.

As in Han and Ogawa (2008) and Chap. 5, when each country's government can determine the optimal privatization level, underprivatization always emerges as a strategic policy. This implies that an open trade policy is a factor in underprivatization. Thus, they point out the need to increase the level of privatization as a coordination policy of the two countries. However, our results show that overprivatization is still possible based on the political behavior of the policymakers.

The structure of this chapter is as follows. In the next section, we construct a closed-economy model with or without lobbying activity by private firms. In Sect. 8.3, we extend the closed-economy model to that of a two-country model. Section 8.4 discusses the policy implications and explores future research possibilities.

8.2 Closed Economy

We describe a mixed oligopoly model with lobbying activity by a private firm. This section investigates the effect of lobbying activity on the optimal privatization policy in a closed economy following Han and Ogawa (2008), and Sect. 8.3 extends this model to a two-country model.

8.2.1 Basic Setting in a Closed Economy

Consider a market in a closed economy served by a partially privatized firm (firm 0) jointly owned by the government and the private sector and a pure private firm (firm 1). Both firms produce a homogenous good, with q_0 and q_1 representing the quantity of output of the public firm and the private firm, respectively. The firms face the inverse demand function $p = 1 - 2Q$, where p and $Q \equiv q_0 + q_1$ denote the price of goods and the aggregate output in this market. Both firms have identical cost

[1] Bernheim and Whinston (1986) and Dixit et al. (1997) developed the lobbying model to extend the theory of common agency.

functions, $c_j = \frac{1}{2}q_j,\ j = 0, 1$; thus, the revenue function of each firm becomes $\pi_j = \{1 - 2(q_0 + q_1)\}q_j - \frac{1}{2}q_j,\ j = 0, 1$. Assuming the demand function is linear, consumer surplus, CS, becomes $CS = Q^2$. Therefore, social welfare is $W = CS + \pi_0 + \pi_1$.

Following Matsumura (1998), the government owns a share of the partially privatized firm, $1 - \theta \in [0, 1]$. Here θ can be seen as the degree of privatization: $\theta = 1$ means a fully privatized firm, and $\theta = 0$ means a fully nationalized firm. Thus, the partially privatized firm's objective function becomes the sum of social welfare and the producer surplus:

$$V = \theta\pi_0 + (1 - \theta)W.$$

Maximizing the above objective function of the public firm and the revenue function of the private firm, we obtain the equilibrium output of the partially privatized firm, q_0^*, the private firm, q_1^*, and the equilibrium price, p^*, as

$$\begin{aligned} q_0^* &= \frac{3}{11 + 10\theta}, \\ q_1^* &= \frac{1 + 2\theta}{11 + 10\theta}, \end{aligned} \tag{8.1}$$

and

$$p^* = \frac{3(1 + 2\theta)}{11 + \theta}$$

where the effect of privatization on the equilibrium outputs of both firms and the equilibrium price are $\frac{dq_0^*}{d\theta} = -\frac{30}{(11+10\theta)^2} < 0$, $\frac{dq_1^*}{d\theta} = \frac{12}{(11+10\theta)^2} > 0$, and $\frac{dp^*}{d\theta} = \frac{36}{(11+10\theta)^2} > 0$, respectively.

Using (8.1), the producer surplus (or profits) of both firms and the consumer surplus become

$$\begin{aligned} \pi_0^* &= \frac{9(1 + 4\theta)}{2(11 + 10\theta)^2}, \\ \pi_1^* &= \frac{5(1 + 2\theta)^2}{2(11 + 10\theta)^2}, \end{aligned} \tag{8.2}$$

and

$$CS^* = \frac{4(2 + \theta)^2}{(11 + 10\theta)^2}.$$

The effect of privatization on the producer surplus of both firms and the consumer surplus can be also calculated as

$$\begin{aligned} \frac{d\pi_0^*}{d\theta} &= \frac{36(3-5\theta)}{(11+10\theta)^2}, \\ \frac{d\pi_1^*}{d\theta} &= \frac{60(1+2\theta)}{(11+10\theta)^2} > 0, \end{aligned} \tag{8.3}$$

and

$$\frac{dCS^*}{d\theta} = -\frac{72(2+\theta)}{(11+10\theta)^2} < 0.$$

From (8.2), equilibrium social welfare can be obtained as $W^* = \frac{23+2\theta(22+7\theta)}{(11+10\theta)^2}$, and then we can obtain the optimal privatization ratio, which satisfies the maximization condition $\frac{dW^*}{d\theta} = 0$ as $\theta^* = \frac{2}{11}$ under a closed economy.

Lemma 8.1 *Optimal privatization ratio in a closed economy* (*Han and Ogawa* 2008).

In a closed economy, partial privatization is the optimal policy, and the privatization ratio is $\theta^* = \frac{2}{11}$.

8.2.2 Political Economic Model in a Closed Economy

In this subsection, we analyze the effect of lobbying by a private firm on the optimal privatization ratio. From the above analysis, the private firm has an incentive to influence the degree of privatization because an increase in θ decreases the output of the public firm and increases the revenue of the private firm. We assume that the private firm can provide contributions, Z, to the policymakers in return for influencing the privatization ratio, θ. Thus, the private firm offers a differentiable contribution schedule for the privatization ratio, $Z(\theta)$, to the policymakers ($Z'(\theta) > 0$). As a result, the payoff for the private firm is

$$\Pi_1 = \pi_1 - Z(\theta). \tag{8.4}$$

As in Cai and Li (2014), policymakers care about the level of the campaign contribution and the social surplus because the number of votes depends not only on the size of the campaign contribution but also on the public endorsement. Thus, the objective function of the policymaker is the sum of the consumer surplus, the producer surplus of the public firm, the producer surplus of the private firm, and the political contributions:

$$G(\theta) = CS + \pi_0 + \Pi_1 + \gamma Z(\theta) = CS + \pi_0 + \pi_1 + (\gamma - 1)Z(\theta), \tag{8.5}$$

where $\gamma(> 1)$ denotes the weight that policymakers put on the political contributions of private firms.

Next, we consider the amount of political contributions from the private firm. Following Grossman and Helpman (1994), we focus on a truthful contribution schedule: $Z(\theta) = \max\{0, \pi_1(\theta) - b\}$. The maximization condition of the private firm has to satisfy

$$\frac{\partial \pi_1}{\partial \theta} = \frac{\partial Z}{\partial \theta}, \tag{8.6}$$

and when this condition is satisfied, $Z > 0$.

We consider a three-stage game. In the first stage, the private firm offers a campaign contribution schedule to the policymaker. In the second stage, the policymaker determines the privatization level. In the third stage, the private firm and the public firm compete in a market. The game is solved by backward induction.

8.2.3 *Optimal Privatization Policy and Lobbying Activity in a Closed Economy*

In the third stage, both firms choose their outputs to maximize their revenue given in (8.1). In the second stage, the policymaker chooses the optimal privatization policy. In the first stage, the two firms determine the contribution schedule.

The policymaker determines the optimal privatization policy to maximize (8.5) subject to (8.6). Then we obtain

$$(\gamma - 1)\frac{d\pi_1(\theta)}{d\theta} + \frac{dW(\theta)}{d\theta} = \frac{12(10\gamma\theta + 5\gamma - 21\theta - 3)}{(11 + 10\theta)^3}.$$

From this equation, the equilibrium privatization ratio, θ^{pc}, becomes

$$\theta^{pc} = \frac{5\gamma - 3}{21 - 10\gamma} > \theta^*. \tag{8.7}$$

Thus, we find that the lobbying activity leads to overprivatization in a closed economy. Differentiating (8.7) by γ, the effect of the policymaker's preference on the privatization ratio is $\frac{\partial \theta^{pc}}{\partial \gamma} = \frac{75}{(21-10\gamma)^2} > 0$. This implies that the private firm can induce the policymaker to choose a preferable policy by providing campaign contributions.

Proposition 8.1 *The optimal privatization policy in a political economic equilibrium in a closed economy.*

In a political equilibrium with lobbying activity by a private firm, the privatization level is higher than the optimal level.

8.3 Two-Country Model

In this section, we extend the closed-economy model to a two-country model as in Chap. 5 and Han and Ogawa (2008). Thus, the basic model is the same as Sect. 8.2 except that there are two symmetric countries, d and f.

8.3.1 Basic Setting of a Two-Country Model

In each country, there is a single public firm and a single private firm. Firms in each country produce homogenous goods and compete in a Cournot fashion in a single integrated market. The inverse demand function of the integrated market is given by $p = 1 - 2\left(q_0^d + q_1^d + q_0^f + q_1^f\right)$, where p and q_j^i represent the market price and the amount of goods sold by firm j in country i.

As with the closed economy, we assume that both firms in each country have identical cost functions, $c_j^i = \frac{1}{2}q_j^i$, $i = d,f$, and $j = 0, 1$. Thus, the revenue function of both firms in each country becomes $\pi_j^i = \left[1 - 2\left(q_0^d + q_1^d + q_0^f + q_1^f\right)\right]q_j^i - \frac{1}{2}q_j^i$ and $j = 0, 1$. Note that the consumer surplus, CS^i, becomes $CS^i = \left(Q^i\right)^2 = 0.25Q^2$ because we assume that the two countries are identical and have $Q^d = Q^f$. Thus, social welfare in country i is given by $W^i = CS^i + \pi_0^i + \pi_1^i$.

The objective function of the manager of the public firm in each country becomes the sum of social welfare and the producer surplus of the firms of its country, $V^i = \theta^i\pi_0^i + \left(1 - \theta^i\right)W^i$, where θ^i represents the privatization ratio in country i. From the revenue maximization of the public and private firms, the outcomes of each firm in Nash equilibrium are

$$\begin{aligned} q_0^d &= \frac{4 + \theta^f - \theta^d}{4\left(4 + \theta^d + \theta^f\right)}, \\ q_0^f &= \frac{4 + \theta^d - \theta^f}{4\left(4 + \theta^d + \theta^f\right)}, \end{aligned} \tag{8.8}$$

and

$$q_1^d = q_1^f = \frac{2 + \theta^d + \theta^f}{4\left(4 + \theta^d + \theta^f\right)}.$$

Substituting (8.8) to the inverse demand function, the world price becomes

$$p^w = \frac{1}{2} - \frac{1}{4 + \theta^d + \theta^f}. \tag{8.9}$$

Using (8.8) and (8.9), we obtain the equilibrium producer surplus (or revenue) of the firms and the consumer surplus in each country by

$$\begin{aligned} \pi_0^d &= \frac{(4 + 3\theta^d + 5\theta^f)(4 + \theta^f - \theta^d)}{32(4 + \theta^d + \theta^f)^2}, \\ \pi_0^f &= \frac{(4 + 3\theta^f + 5\theta^d)(4 + \theta^d - \theta^f)}{32(4 + \theta^d + \theta^f)^2} \\ \pi_1^d &= \pi_1^f = \frac{3(2 + \theta^d + \theta^f)^2}{32(4 + \theta^d + \theta^f)^2}, \end{aligned} \tag{8.10}$$

and

$$CS^d = CS^f = \frac{\left(6 + \theta^d + \theta^f\right)^2}{16\left(4 + \theta^d + \theta^f\right)^2}.$$

Differentiating (8.8), (8.9), and (8.10) with respect to the privatization ratio, we find that the effects of the privatization level on the output of all firms, the world price, the consumer surplus, and the producer surplus of all firms in both countries are as follows:

$$
\begin{aligned}
&\frac{\partial q_0^i}{\partial \theta^i} = -\frac{4+\theta^{-i}}{(4+\theta^i+\theta^{-i})^2} < 0,\\
&\frac{\partial q_0^{-i}}{\partial \theta^i} = \frac{\theta^{-i}}{2(4+\theta^i+\theta^{-i})^2} > 0,\\
&\frac{\partial q_1^i}{\partial \theta^i} = \frac{\partial q_1^{-i}}{\partial \theta^i} = \frac{1}{2(4+\theta^i+\theta^{-i})^2} > 0,\\
&\frac{\partial p^w}{\partial \theta^i} = \frac{1}{(4+\theta^i+\theta^{-i})^2} > 0,\\
&\frac{\partial CS^i}{\partial \theta^i} = \frac{\partial CS^{-i}}{\partial \theta^i} = -\frac{6+\theta^i+\theta^{-i}}{4(4+\theta^i+\theta^{-i})^3} < 0,\\
&\frac{\partial \pi_0^i}{\partial \theta^i} = \frac{8-(\theta^{-i})^2-14\theta^i-\theta^{-i}(2+3\theta^i)}{8(4+\theta^i+\theta^{-i})^3},\\
&\frac{\partial \pi_0^{-i}}{\partial \theta^i} = \frac{3(\theta^{-i})^2-(2-\theta^i)\theta^{-i}+2(4+\theta^i)}{8(4+\theta^i+\theta^{-i})^3} > 0,
\end{aligned}
\tag{8.11}
$$

and

$$
\frac{\partial \pi_1^i}{\partial \theta^i} = \frac{\partial \pi_1^{-i}}{\partial \theta^i} = \frac{3\left(2+\theta^i+\theta^{-i}\right)}{8\left(4+\theta^i+\theta^{-i}\right)^3} > 0,
$$

where superscript $-i$ means the country's variables except for country i. From (8.11), the increase of the degree of domestic privatization decreases the consumer surplus in each country and increases the foreign firms' producer surplus. Therefore, the domestic policymaker has an incentive to decrease the privatization level.[2]

Using (8.10), social welfare in each country becomes

$$
W^i = \frac{25+13\theta^i+\theta^{-i}(13+3\theta^i+2\theta^{-i})}{8(4+\theta^i+\theta^{-i})^2}. \tag{8.12}
$$

Each benevolent policymaker maximizes (8.12) by choosing θ^i given by θ^{-i}. Thus, we obtain the first-order condition as follows:

$$
\frac{dW^i}{d\theta^i} = \frac{13\theta^i+3\theta^i\theta^{-i}+\left(\theta^{-i}\right)^2+\theta^{-i}-2}{4+\theta^i+\theta^{-i}} = 0.
$$

Solving this equation for θ^i, the optimal reaction function for the privatization policy of country i becomes $\theta^i = \frac{\left(1-\theta^{-i}\right)\left(2+\theta^{-i}\right)}{13+3\theta^{-i}}$. Using the symmetric assumption of the two countries, we obtain the optimal privatization level in Nash equilibrium:

[2] (8.11) means that an increase in θ^i decreases q_0^i and increases q_0^{-i} and p^w.

$$\theta^d = \theta^f = \frac{1}{4}\left(\sqrt{57} - 7\right) \tag{8.13}$$

Lemma 8.2 (*Proposition 1 in Han and Ogawa* (2008)).
The extent of privatization in an international mixed oligopoly with two countries is smaller than that in a mixed oligopoly with a single domestic market.

As mentioned above, privatization increases the producer surplus of the domestic public firm and the foreign private firm and decreases the consumer surplus.[3] Thus, the domestic policymaker prevents the flow of the domestic surplus to foreign producers. The coordinated problem provides the following first-order condition:

$$\frac{dW^w}{d\theta^i} = \frac{dW^i}{d\theta^i} + \frac{dW^{-i}}{d\theta^i} = \frac{\left(\theta^{-i}\right)^2 - 5\theta^i - \left(1 + \theta^i\right)\theta^{-i} + 2}{4 + \theta^i + \theta^{-i}} = 0.$$

By solving this, the optimal privatization levels in the two countries' economies become

$$\theta^d = \theta^f = \theta^{w*} = \frac{1}{3}. \tag{8.14}$$

By comparing (8.13) and (8.14), we obtain Lemma 8.3.

Lemma 8.3 (*Proposition 2 in Han and Ogawa* (2008)).
When lobbying activity is prohibited, underprivatization occurs in an international mixed oligopoly with two countries.

8.3.2 Optimal Privatization Policy in a Two-Country Political Economic Model

In this section, we illustrate the effect of domestic lobbying activity on the privatization policy in a two-country setting.[4] To compare results, the basic setting is the same as in Sect. 8.3.1.

As in Sect. 8.2, the payoff of the private firm in each country is

$$\Pi_1^i = \pi_1^i - Z^i\left(\theta^i\right), \tag{8.15}$$

[3] See (8.11).

[4] In this chapter, we do not examine international lobbying or cross-border lobbying.

where $Z(\theta^i)$ represents the contribution schedule that the private firms optimally choose. The policymaker chooses the privatization level to maximize the weighted sum of social welfare, $CS^i + \pi_0^i + \Pi_1^i$, and $Z^i(\theta^i)$ as follows:

$$\begin{aligned} G^i(\theta^i) &= CS^i(\theta^i) + \pi_0^i(\theta^i) + \Pi_1^i(\theta^i) + \gamma^i Z^i(\theta^i), \\ &= CS^i(\theta^i) + \pi_0^i(\theta^i) + \pi_1^i(\theta^i) + (\gamma^i - 1)Z^i(\theta^i), \end{aligned} \tag{8.16}$$

where $\gamma^i (> 1)$ denotes the weight that the policymakers in each country put on the political contributions of domestic private firms. As in Sect. 8.2.3, private firms should select the following contribution schedule: $Z^i(\theta^i) = \max\{0, \pi_1^i(\theta^i) - b^i\}$. Thus, we obtain the maximization condition of the domestic lobbying agent in country i as

$$\frac{\partial \pi_1^i}{\partial \theta^i} = \frac{\partial Z^i}{\partial \theta^i}, \tag{8.17}$$

when this condition is satisfied, $Z^i > 0$.

8.3.3 *Inference of Lobbying Activity into the Privatization Policy in a Two-Country Model*

Policymakers in each country maximize the objective function (8.16) by choosing the privatization level subject to (8.17):

$$(\gamma^i - 1)\frac{d\pi_1^i(\theta^i)}{d\theta^i} + \frac{dW^i}{d\theta^i} = \frac{3\gamma^i(2 + \theta^i + \theta^{-i}) - (3\theta^{-i} + 16)\theta^i - (\theta^{-i} + 2)^2}{8(4 + \theta^i + \theta^{-i})^3} = 0.$$

By solving this first-order condition for θ^i, the reaction function of country i becomes $\theta^{pc,i} = \frac{(\theta^{-i})^2 + 4\theta^{-i} - 3\theta^{-i}\gamma^i - 6\gamma^i + 4}{3\gamma^i - 3\theta^{-i} - 16}$. Under the symmetric assumption, the privatization level in a two-country economy becomes

$$\theta^{pc,i} = \frac{1}{4}\left(\sqrt{3}\sqrt{28 - 12\gamma^i + 3(\gamma^i)^2} + 3\gamma^i - 10\right) \gtreqless \theta^{w*}. \tag{8.18}$$

Thus, we find that this Nash equilibrium privatization level is affected by the weight of the campaign contribution, $\gamma^i > 0$. When the policymaker has a strong interest in campaign contributions compared with the flow of domestic social surplus, the policymaker increases the privatization level to acquire campaign contributions.

Proposition 8.2 *Optimal privatization policy in a political economic equilibrium in a two-country model.*

When a private firm lobbies policymakers and policymakers' interests are stronger (*weaker*) *than 25/18, underprivatization* (*overprivatization*) *occurs in an international mixed oligopoly with two countries.*

Proof By solving (8.18) to $\gamma^i > 0$, we obtain $\gamma^i = 25/18$.

This proposition implies that the strategic effect shown in Lemma 8.3 is canceled out by the domestic lobbying effect, which is shown in Proposition 8.1. When the politicians' interests are 25/18, the privatization level also corresponds to the optimal privatization level, θ^{w*}.

Corollary 8.1 *The Nash equilibrium privatization level in a two-country model corresponds to the socially optimal level when politicians' interests are 25/18.*

8.4 Discussion and Remaining Issues

This chapter analyzed the effect of lobbying activity by private firms on the optimal privatization level. As a result, we obtained two main results. First, in a closed economy, lobbying activity leads to overprivatization. Second, in a two-country economy, if and only if policymakers have a strong (weak) interest in campaign contributions, lobbying activity leads to overprivatization (underprivatization).

8.4.1 Implications of Lobbying Activity in a Closed Economy

In a closed economy, policymakers can control the output of the public firm by choosing the privatization level; here they choose lower partial privatization. However, private firms do not seek such lower partial privatization because it results in a greater output by public firms. As a result, this conflict between private and public leads to political pressure. Thus, private firms can increase their own revenue by providing campaign contributions. However, the size of the revenue depends on the interests of the policymaker. A higher level of privatization and higher revenue can be achieved when the policymaker has a high interest in campaign contributions.

The privatization level induced by lobbying activity leads to overprivatization rather than a socially optimal level. Thus, a high interest in campaign contributions by the policymaker reduces social welfare rather than increases the revenue of private firms.

8.4.2 Implications of Lobbying Activity in an Open Economy

In an open economy, two opposite effects are evident: the strategic effect (in a pure market), which was explained in Sect. 8.2, and the political effect, explained in Sect. 8.3. The former is caused by the strategic policy in each country. As in Han and Ogawa (2008) and Chap. 5, an open trade policy creates an outflow of domestic surplus. A benevolent policymaker chooses a low level of privatization to prevent such an outflow. The latter effect is caused by the lobbying activity of private firms. When a policymaker receives a campaign contribution, the private firm can increase its revenue by increasing the level of privatization.

Thus, we find that the optimal privatization policy is determined by two contrasting effects: the strategic effect reduces the privatization level, and the political effect increases the privatization level. Based on these considerations, when these two effects are canceled out, the privatization level corresponds to the socially optimal privatization level. This means that although only benevolent policymakers provide a low level of privatization, if a policymaker has an interest in obtaining campaign contributions, social surplus may increase in a two-country economy.

8.4.3 Other Types of Lobbying

Finally, we consider the possibility of extending this model to incorporate various types of lobbying effects.

First, we consider the case of lobbying competition between public and private firm. This differs from monopsonistic lobbying as in this chapter because the equilibrium output of the mixed oligopoly is characterized by asymmetric outputs. This situation induces different levels of equilibrium campaign contributions.

Second, we consider the effect of a change in the number of private firms. When private firms can increase their profits by providing campaign contributions, they always lobby policymakers. However, in general, lobbying itself is not conducted by one firm but by a number of firms. From this perspective, as in Mitra (1999) and Kagitani (2008), we can consider how a lobby is endogenously formed using a model with the organizational costs of lobby because the properties of lobbying are characterized by public goods that cause the free-rider problem.

Third, we consider the possibility of lobbying by foreign firms to domestic policymakers as in Huang et al. (2015). In this case, lobbying competition occurs between domestic and foreign firms, and the policymaker's objective function becomes $W^h = W^{h,\text{only}} + \varphi Z^f$, where the domestic social surplus, campaign contribution, and the preference parameter of the foreign campaign contribution are $W^{h,only}$, Z^f, and φ, respectively. Such foreign contributions will induce a higher level of privatization to increase the profits of foreign firms.

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