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## Heterogeneous Firms and Lobby Participation Decision

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## Abstract

TThe study analyzes the lobby participation decision of a firm in the heterogeneous firms model. To endogenize the lobby participation decision at firm-level, an additional stage in the standard political economy of trade policy framework has been introduced. This additional stage entails information about the lobby participation decision of a firm. By assuming fixed and sunk costs associated with lobby participation, we have shown that the firm with productivity above a threshold level can only afford to engage in the lobby. Moreover, the lobby participation decision depends not only on the participation cost but also on the market size and the benefits of lobbying. Our results conform to empirical findings related to the lobbying participation behavior of firms.

# 1. Introduction

This paper seeks to characterize the political economy of trade policy in the Melitz (2003) model of heterogeneous firms. In this model, the existence of markup and entry distortions provide the rationale, besides the terms-of-trade, for trade policy intervention (Felbermayr et al. 2013). Therefore, one of the objectives of trade policy is to counterbalance these distortions. However, the enactment of trade policy affects the production and participation decisions of firms. Resultantly, firms put efforts to influence the policy level selection by the policymaker via lobbying activities. Nevertheless, due to the existence of costs associated with lobby participation, not all firms active in the market can afford to participate. Empirical evidence also settles that the lobby participation decision of a firm depends on the size and productivity of the firm (see, inter alia, Dellis and Sondermann 2017, Kim 2017, Kerr et al. 2011, and Weymouth 2012). Yet most theoretical studies, with some exceptions,[1] assume the lobby participation decision of a firm as exogenously given. Hence, this study aims to endogenize the lobby participation of a firm in the model of heterogeneous firms along with trade policy formation. In this regard, we extend the Melitz (2003) model by introducing the protection for sale (PFS) framework of Grossman and Helpman (1994) in these settings.

The decision to participate in lobbying activities or not is the decision of an individual firm in case of heterogeneous firms. Since product differentiation leads to firm-level lobbying instead of industry-level lobbying (Kim 2017). Also, the probability to be organized and participate in lobbying activities at the industry level is less when the product substitutability is high (Paltseva 2014). In addition, the existence of greater variations in intra-industry tariff rates compared to inter-industry tariff rates also corroborate firm-level lobbying (Bombardini 2008). In this model, on the basis of empirical observations, we also consider the possibility of foreign firms lobbying in the home country along with domestic firms.[2] Aidt and Hwang (2014) legitimize the involvement of foreign firms in the lobby on the bases of cross-national externalities argument, which associates the welfare of foreign firms with the home country's trade policy. Moreover, by allowing the possibility of foreign firms lobby participation, the biases in the PFS framework towards export subsidies, as emphasized by Rodrik (1995), can also be tackled.

The initiative to endogenize lobby formation decisions of an industry in the PFS framework has been taken by Mitra (1999). He performs this task by introducing an additional stage in the PFS framework, where the decision to get organized or remain unorganized takes place on the basis of associated costs. While the policymaker and organized group interact at the second stage. Another study by Bombardini (2008) introduces the heterogeneity aspect of firms in the analysis and formulates the optimal lobby criterion that regulates the lobby participation decision of firms. According to this criterion, it is optimal for a firm to join the lobby if the joint surplus of the industry increases after the participation of that particular firm. Otherwise, the optimal decision for the firm is no-participation in the lobby group.

In order to endogenize the lobby participation decision of a firm, an additional stage in the standard political economy of trade policy framework has been introduced. This additional stage entails information about the lobby participation decision of a firm. Our analysis indicates that the decision to participate in the lobby depends upon three factors; the market size, the benefits of

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[1] For Example; Bombardini (2008), Mitra (1999)

[2] As Gawande et al. (2006) and Stoyanov (2009) presents the case of foreign firms participation in the lobby for trade policy formation of the US.

lobby, and the cost of lobbying. More productive firms can afford the costs associated with lobbying activities, therefore, more inclined to lobby.

# 1. The Model

Consider a model of two countries, home country $i$ and foreign country $j$. The economy of each country consists of two sectors; a homogeneous good producing sector and a differentiated good producing sector. The utility function of a representative agent in the home country is given by;

$$U_i = Q_0 + \frac{1}{\theta}\left(\int_{\omega \in \Omega_n}(q_{ni}(\omega))^{(\sigma-1)/\sigma}d\omega\right)^{\frac{\theta\sigma}{(\sigma-1)}}, n \in \{i,j\} \tag{1}$$

where $\Omega_n$ is the set of a continuum horizontally differentiated good and $\sigma = \left(\frac{1}{1-\rho}\right) > 1$ is the elasticity of substitution between the varieties. $Q_0$ is the consumption of homogeneous good and $q_{ni}(\omega)$ is the consumption of $\omega$ variety of differentiated goods. $\theta \in (0,1)$ measures the substitution between the consumption of the homogenous good and the differentiated varieties. Given the total spending $Y_i$ and price of an imported variety $\omega$ as $p_{ji}(\omega)$, the above utility function generates the following demand of the imported variety $\omega$ of differentiated good in the home country;

$$q_{ji}(\omega) = P_i^{\frac{\sigma(1-\theta)-1}{(1-\theta)}}\left(p_{ji}(\omega)\right)^{-\sigma} \tag{2}$$

where $P_i$ is the ideal price index in home country $i$;

$$P_i = \left(\int_{\omega \in \Omega_n}\left(p_{ni}(\omega)\right)^{1-\sigma}d\omega\right)^{1/1-\sigma}, n \in \{i,j\} \tag{3}$$

Labor is the only factor of production with the wage rate $w$ and homogenous good is produced under perfect competition with a unit input-output coefficient. Labor is movable among sectors and homogenous good trade freely and acts as numeraire in the model. However, differentiated varieties are produced by a continuum of heterogeneous firms, as in Melitz (2003). These heterogeneous firms produce under monopolistic competition with production technology, $\left(l_n = f_n + \frac{q_n}{\varphi_n}, n \in \{i,j\}\right)$. The productivity of the firm $\varphi_n$ is drawn from cumulative distribution $G(\varphi_n)$ after incurring the sunk entry cost $f_n^e$. Besides the entry cost, the production process also involves an overhead fix cost $f_n$ that depends on the market location. Domestic firms that serve domestic market incur $f_{ii}$ fixed cost and when access foreign market bear $f_{ij}$ fixed cost, with $f_{ii} < f_{ij}$.

Trade among countries involve the transport cost and trade taxes. The transport cost is iceberg type and in order to send one unit of the good to the foreign market, domestic firm ship $\tau_{ij} > 1$ units, where $\tau_{ii} = 1$. The trade taxes are imposed by country such that the home country $i$ imposes tax $\eta_{ij} = (1+t_{ij})$ on imports from the foreign country and provides a subsidy $\gamma_{ij} = (1+s_{ij})$ to domestic exporting firms. Where, $\eta_{ij} > 1$ indicates import tariff and $\eta_{ij} < 1$ indicates import subsidy, while $\gamma_{ij} > 1$ indicates an export subsidy and $\gamma_{ij} < 1$ indicates an export tax. Furthermore, it is possible to devise the tariff and subsidy at the micro-level and different varieties of differentiated goods face different tariff or subsidy rate. This implies that the policymaker can treat heterogeneous firms in the differentiated sector dissimilatory. This kind of discriminatory tax treatment would yield optimal policy level compare to uniform treatment in case of import tariff (Costinot et al. 2016). Following Costinot et al. (2016), we also assume that the home country $i$ is strategic and imposed taxes in order to maximize welfare. While the foreign country $j$ is passive and does not impose taxes.

The policymaker in the home county adopts a uniform tax policy in the absence of lobbies and all importing firms face the same level of import tariff, while all exporting firms face the same subsidy level. However, the policymaker inclines to accept the political offerings from firms to change the trade policy level. In this case, the discriminatory tax level will be selected for a lobbying firm and rest of non-lobbying firms face the same benchmark tax level. Therefore, the possibility to lobby for the trade policy also exists in the home country. A firm that participates in lobby endures fixed and sunk costs of the lobby, such that $\tilde{c}_i = f_i^{lb} + c_i$. The fixed cost of the lobby $f_i^{lb}$ occurs while channelizing lobbying strategy like hiring a professional lobbyist, as suggested by Richter et al. (2009). While the sunk cost $w_n c_i$ presents in the form of contribution schedule, which is the monetary contribution offered by the firm to the policymaker.

Since the heterogeneous firms face a residual demand curve with constant elasticity, therefore, charged a constant markup $\left(\frac{\sigma}{\sigma-1}\right)$. The optimal price charged by the foreign importing firm in the $i$-market is $p_{ji}(\varphi_{ji}) = \left(\frac{\sigma}{\sigma-1}\right)\frac{\eta_{ji}\tau_{ji}}{\varphi_{ji}}$. Similarly, the price charged by the domestic exporting firm in $j$-market is $p_{ij}(\varphi_{ij}) = \left(\frac{\sigma}{\sigma-1}\right)\frac{\tau_{ij}}{\gamma_{ij}\varphi_{ij}}$. The pricing rule indicates that the price charged by a firm is inversely related to the productivity of the firm. However, a firm's decision to serve another country's market depends on her productivity level. The minimum productivity level of a firm from foreign country $j$ wants to serve home country $i$ is determined by zero-profit condition. Therefore, the zero-profit condition for the foreign importing firm is given as;

$$
\begin{cases}
\eta_{ji}^{wl^{-\sigma}} P_i^{\frac{\sigma(1-\theta)-1}{(1-\theta)}} \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \left(\frac{\varphi_{ji}}{\tau_{ji}}\right)^{\sigma-1} = \sigma f_{ji} \quad \text{without lobby participation} \\
\eta_{ji}^{lb^{-\sigma}} P_i^{\frac{\sigma(1-\theta)-1}{(1-\theta)}} \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \left(\frac{\varphi_{ji}}{\tau_{ji}}\right)^{\sigma-1} = \sigma(f_{ji} + \tilde{c}_i) \quad \text{with lobby participation}
\end{cases} \tag{4}
$$

These conditions give the cutoff productivity to serve the home country $\varphi_{ji}^{wl^*}$ without lobbying participation and the cutoff productivity to serve the home country as well as to participate in lobby $\varphi_{ji}^{lb^*}$.[3] The productivity parameter is restricted, such that $\varphi_{jj}^* < \varphi_{ji}^{wl^*} < \varphi_{ji}^{lb^*}$, where $\varphi_{jj}^*$ is the domestic market cutoff productivity level. Thus, only more productive firms engage in exports and lobbying business. If the mass of potential entrants in foreign country $j$ is $M_j^e$, then the mass of active firms would be $M_j = \left(1 - G(\varphi_{jj}^*)\right) M_j^e$. Therefore, the mass of exporters to the country $i$ is

$M_{ji} = m_{ji} M_j$, where $m_{ji} = \frac{\left(1 - G(\varphi_{ji}^{wl^*})\right)}{\left(1 - G(\varphi_{jj}^*)\right)}$ is the export rate. Similarly, the mass of exporters that also participate in lobbying is $M_{ji}^{lb} = m_{ji}^{lb} M_j$, where $m_{ji}^{lb} = \left(\frac{1 - G(\varphi_{ji}^{lb^*})}{1 - G(\varphi_{jj}^*)}\right)$ is the export and lobbying participation rate. To make the analysis more tractable, we postponed the discussion related to the difference between the lobby cutoff productivity $\varphi_{ji}^{lb^*}$ and without lobbying cutoff productivity $\varphi_{ji}^{wl^*}$ until section 2.2, and here we focus only on the simple cutoff productivity level of foreign firms to serve the home country $\varphi_{ji}^*$. The productive distribution is assumed to follow Pareto

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[3] Where $wl$ and $lb$ in the superscripts indicates the value of the variable *without lobbying* and *with lobbying*.

Distribution.[4] The productivity distribution in country $j$ is $G(\varphi_j) = 1 - \left(\frac{\varphi_j}{\varphi}\right)^\alpha$, with $\underline{\varphi}_j$ being the lowest possible productivity draw and $\alpha$ is the shape parameter and represents the dispersion of productivity, with $\alpha > \sigma - 1$. The productivity cutoffs for home country $i$ can also be defined in the same fashion. By considering the minimum productivity cutoff, expected profit of a firm from foreign country $j$ serving the market $i$ can be expressed as $\bar{\bar{\pi}}_{ji} = (\psi - 1)(f_{ji} + \tilde{c}_i)$, where $\psi = \alpha/(\alpha - \sigma + 1)$. So, the free entry condition can be expressed as (see online appendix);

$$(\psi - 1)(\varphi_{jj}^*)^{-\alpha}\left(f_{jj} + m_{ji}(f_{ji} + c_i)\right) = f_j^e\left(\underline{\varphi}_j\right)^{-\alpha} \tag{5}$$

From this equation, we can determine the unique value of $\varphi_{jj}^*$ that depends only on the parameters of the model. By taking the optimal pricing rule and Pareto distribution of productivity into consideration, the ideal price index transforms as;

$$P_i^{1-\sigma} = \psi\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\sum_{n\in\{i,j\}}m_{ni}M_n\left(\frac{\varphi_{ni}^*}{\eta_{ni}\tau_{ni}}\right)^{\sigma-1} \tag{6}$$

Since the mass of active firms in home country $i$ can be measured by using the labor market clearing condition. Therefore, the mass of active firms in home country $i$ is;

$$M_i = \frac{(\psi-1)L_i}{\psi\sigma f_i^e}\left(\frac{\varphi_i}{\varphi_{ii}^*}\right)^\alpha \tag{7}$$

From the utility function, the per worker welfare can be expressed as;

$$U_i = Y_i + \frac{1-\theta}{\theta}P_i^{-\frac{\theta}{1-\theta}} \tag{8}$$

where the last term on the right-hand side specifies the consumer surplus and $Y_i$ is the income level at home country $i$. The income consists of labor income and the lump-sum transfer from the government, $Y_i = w_iL_i + R_i$. Theses lump-sum transfers are made up of net tax revenue;

$$R_i = (\eta_{ji} - 1)m_{ji}M_j\bar{r}_{ji} + (1 - \gamma_{ij})m_{ij}M_i\bar{r}_{ij} \tag{9}$$

Where $\bar{r}_{ji}$ is the expected revenue accrued by the foreign importing firms in market $i$ and given as;

$$\bar{r}_{ji} = \psi P_i^{\frac{\sigma(1-\theta)-1}{(1-\theta)}}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\tau_{ji}^{1-\sigma}\eta_{ji}^{-\sigma}\varphi_{ji}^{*\,\sigma-1} \tag{10}$$

The utility function of the policymaker in home country $i$ is assumed to be based on single-peaked preferences with respect to trade policy $T_i$ with $(\eta_{ji}, \gamma_{ij} \in T_i)$, where $\eta_{ji}$ and $\gamma_{ij}$ are the vectors of import and export tax. The policymaker's objective function is;

$$W_i(T_i, c_i) = bSW_i(T_i) + \sum_{n,n'\in\{i,j\},n\neq n'}m_{nn'}M_nc_i(T_i) \tag{11}$$

The utility of the policymaker depends on the vector of political contributions $w_nc_i$ and weighted social welfare $SW_i$. The political contributions link positively with policymaker utility and a higher level of contributions is preferable. While the social welfare enters into the utility function with weight $b$. The weight assign to social welfare depends upon the degree of the benevolence of the policymaker. The social welfare comprises producer surplus (which is zero due to free entry condition), consumer surplus, and net transfer;

$$SW_i(T_i) = CS_i + R_i(T_i)$$

Compared to this, firms want to maximize profits. Since the gross profits are constant proportion to revenues and the margin is also constant, therefore, firms are more concerned with operating profits $\hat{\pi}$. The objective function of a lobbying firm from home country $i$ is given as;

$$V_i(T_i, c_i) = \sum_{n\in\{i,j\}}\left(\hat{\pi}_{in}^{lb}(T_i) - c_i\right) \tag{12}$$

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[4] See Axtell (2001), Helpman et al. (2004), and Melitz and Redding (2012).

Following Mitra (1999) and Bombardini (2008), we devise this game of endogenous trade policy in two-stages. At the first stage, the firm decides whether to participate in the lobby and bears the associated fixed and sunk costs or remains politically inactive. While, at the second stage, the interaction between the policymaker and lobbying firms takes place. The solution of the game can be figured out by solving backwardly.

## 1.1. Second Stage

As in the PFS, the interaction between the policymaker of home country $i$ and lobbying firms articulate as "common agency problem". The policymaker acts as agent and lobbying firms as principals. Firm moves first and offers a political contribution schedule to the policymaker keeping in view the political contributions offered by other lobbying firms. Later, the policymaker chooses the policy level and receives political contributions. The underlying condition at this stage's sub-game Nash equilibrium is that the optimal equilibrium pair of policy level and contribution is jointly efficient for both the policymaker and the lobbying firm.

*Assumption 1:* contribution schedules are differentiable around the equilibrium.

*Assumption 2:* Contribution Schedules are truthful;

$$c_i(T_i) = max\{0, \hat{\pi}_{nn'}^{lb}(T_i) - B_n\}, (n, n') \in \{i, j\}, n \neq n'$$

where, $B_n$ is the welfare anchor of the firm. We focus only on those equilibria where lobbying firm make positive contributions;

$$c_i(T_i) = (\hat{\pi}_{nn'}^{lb}(T_i) - B_n), (n, n') \in \{i, j\}, n \neq n' \qquad (13)$$

With the mass of lobbying firm given, the optimal policy level can be determined by the following condition (for derivation see appendix E in the supplemental material);

$$\sum_{n,n' \in \{i,j\}, n \neq n'} m_{nn'} M_n \frac{\hat{\pi}_{nn'}(T_i^*)}{\partial T_i^*} + b \frac{\partial SW(T_i^*)}{\partial T_i^*} = 0 \qquad (14)$$

From the above condition, the equilibrium import tariff and export tax level selected by the policymaker formulate as;

$$\eta_{ji} = \frac{\alpha(b\sigma - 1)}{b\sigma(\alpha - 1)}$$

$$\gamma_{ij} = \frac{\alpha(b\sigma + 1)}{b(\alpha\sigma + \sigma - 1)}$$

The above formulations indicate that the policymaker selects a pair import tariff and export tax in order to maximize welfare as, $\eta_{ji} > 1$ and $\gamma_{ij} < 1$. Taking together the optimal pricing rule in the equation (4) and above equilibrium policy levels, it is apparent that the targeted policy instrument for the domestic firm is the export tax. As reasoned by Grossman & Helpman (2001, pp. 240-243) targeting the subsidy level instead of the tariff would be more welfare enhancing for the domestic lobbying firms as well as for the aggregate welfare. Similarly, the foreign lobbying firm always targets import tariff, which enters directly into the operating profit of the firm.

***Proposition-1:*** *Given the import tariff and export tax selected as trade policy tools at the equilibrium. The presence of lobbying firms affects the policy level selection, such that*

$$\eta_{ji}^{wl} > \eta_{ji}^{lb} \text{ and } \gamma_{ij}^{wl} < \gamma_{ij}^{lb}.$$

As the appendix F in the supplemental material characterizes the equilibrium without lobbying firm. By labelling the equilibrium policy level in the absence of lobbying firms as the benevolent equilibrium and equilibrium in the presence of lobbying firms as the political equilibrium. The appendix shows that at benevolent equilibrium, the import tariff and export tax levels selected by the policymaker are; $\eta_{ji}^{wl} = \frac{\alpha}{\alpha - 1}$ and $\gamma_{ij}^{wl} = \frac{\alpha\sigma}{\alpha\sigma + \sigma - 1}$, respectively. Therefore, the presence of

lobbying firms affects the policy level selection of the policymaker. The difference in the policy level selection is also straightforward to see by looking at equation (14). In the case of benevolent equilibrium, the second part on the left-hand side of the equation is zero. To further elaborate this point, consider a quantitative illustration. Following Bernard et al. (2003), by taking the estimates of the elasticity of substitution $\sigma$ equal to 3.8 and the shape parameter $\alpha$ equal to 4, with $b = 10$, we have the import tariff without lobbying $\eta_{ji}^{wl} = 1.33$ and with lobbying $\eta_{ji}^{lb} = 1.29$. While with same parametric values, the export tax without lobbying $\gamma_{ij}^{wl} = 0.84$ and with lobbying $\gamma_{ij}^{lb} = 0.87$.

## 1.2. First Stage: Selection into Lobbying

To proceed further, reconsider the profit function of a domestic exporting firm, which is given as;[5]

$$\begin{cases} \pi_{ij}^{wl}(\varphi_{ij}) = \hat{\pi}_{ij}^{wl}(\varphi_{ij}) - f_{ij} & \text{without lobby participation} \\ \pi_{ij}^{lb}(\varphi_{ij}) = \hat{\pi}_{ij}^{lb}(\varphi_{ij}) - (f_{ij} + \tilde{c}_i) & \text{with lobby participation} \end{cases} \quad (15)$$

While, the total cost of production associated with lobby participation and without lobby participation for a domestic exporting firm can be written as, $CP_{ij}^{lb} = \left(\frac{\tau_{ij} q_{ij}}{\varphi_{ij}} + f_{ij} + \tilde{c}_i\right)$ and $CP_{ij}^{wl} = \left(\frac{\tau_{ij} q_{ij}}{\varphi_{ij}} + f_{ij}\right)$.

***Proposition-2:*** *Due to the costs associated with lobby participation, only most productive domestic exporting firms find it worthwhile to bear the cost of lobbying and to benefit from a lower export tax rate. Therefore, lobbying is the ideal choice only for the domestic exporting firm with a productivity $\varphi_{ij} > \hat{\varphi}_{ij}^{lb}$, given the benefits of lobbying are more than the cost of lobbying.*

From the cost of production, we know that $CP_{ij}^{wl} < CP_{ij}^{lb}$. This indicates that not all exporting firms might able to recover the costs of lobbying. Firms with low productivity level might find that
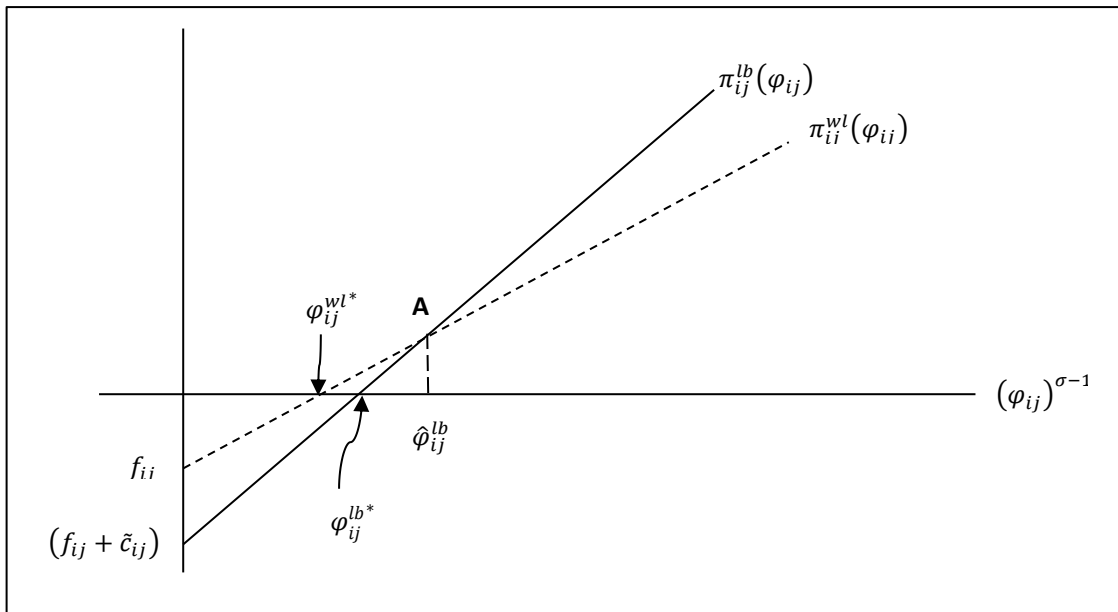
$\pi_{ij}^{wl}(\varphi_{ij}) > \pi_{ij}^{lb}(\varphi_{ij})$ and the optimal strategy for the firm is to not participate in the lobby. However, a firm with a sufficiently high productivity level may find it optimal to engage in the lobby. Nevertheless, the benefits of lobbying come in the form of a decrease in export tax $(\gamma_{ij}^{lb} > \gamma_{ij}^{wl})$. The figure shows that due to a decrease in export tax the profit function with lobbying has a steep slope. Moreover, at point A $\pi_{ij}^{wl}(\varphi_{ij}) = \pi_{ij}^{lb}(\varphi_{ij})$. By utilizing the definitions from (15), we can express the lobby participation condition for domestic exporting firm as;

$$\hat{\pi}_{ij}^{lb}(\varphi_{ij}) - \hat{\pi}_{ij}^{wl}(\varphi_{ij}) - c_i = f_i^{lb} \qquad (16)$$

The above equation states that firm does not participation unless the net benefits of lobbying are equal to the fixed cost of lobbying. Resultantly, the lobby participation is an optimal choice for a domestic exporting firm with productivity $\varphi_{ij} > \hat{\varphi}_{ij}^{lb}$, where $\hat{\varphi}_{ij}^{lb}$ is the productivity level at which firm earns the same level of profit with lobbying and without lobbying and given as (see appendix);

$$\hat{\varphi}_{ij}^{lb} = \left( \frac{\tilde{c}_i}{B\left[\left(\gamma_{ij}^{lb}\right)^{\sigma} - \left(\gamma_{ij}^{wl}\right)^{\sigma}\right]} \right)^{\frac{1}{\sigma-1}} \qquad (17)$$

This equation also specifies the determining factors of lobby participation which are; the cost of lobbying, benefits of lobbying in terms of change in policy level, and the market size measured by $B$. The benefits of lobbying and the market size have a negative relationship with the lobby participation productivity level $\hat{\varphi}_{ij}^{lb}$, while the cost of lobby has a positive relationship. This shows that firms in a large market with larger benefits of lobbying are more inclined to lobby, whereas a higher cost of lobby discourages firm to participate in the lobby.

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