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## Entry barriers to motivate multinational joint ventures: A mixed oligopoly analysis

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## **ADB Working Paper Series**

### **ENTRY BARRIERS TO MOTIVATE MULTINATIONAL JOINT VENTURES: A MIXED OLIGOPOLY ANALYSIS**

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**Abstract**

Several developing countries impose high tariffs, directly or indirectly, on imports of manufactured goods such as vehicles and machinery. In many cases governments argue that they need such policies to protect domestic manufacturing industries from foreign competition while simultaneously allowing joint ventures between domestic manufacturers and foreign ones. This study asks whether foreign businesses actually benefit more from entering a market through joint ventures where their competitors cannot enter due to high trade barriers and domestic manufacturers' monopoly. Our results answer this question in the affirmative under several scenarios. Results show that while governments use tariffs to interact strategically with other governments and foreign firms, they also use them to manage the co-integration of markets.

**Keywords:** international trade, mixed oligopoly market, market entry, auto industry

**JEL Classification:** L13, L23, F13

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# 1. INTRODUCTION

The main research question for this study presented itself after a review of Iran's car manufacturing industry. Similar to several other developing countries, Iran either imposes or has imposed heavy tariffs and taxes on imports of machinery, cars, and other manufactured products. The stated official intent is often to support domestic producers. Such tariffs vary from 40% to 55% based on the type of car. With taxes added, one might pay as much as 80% more to import a vehicle manufactured in Germany or Japan.

Some analyses (see Dadpay 2017) point out that sales and deliveries for French vehicle manufacturer PSA Group increased by 5.6% in 2016 compared to the previous year when the company incorporates sales from its joint ventures and agreements in Iran. Without Iran's market, PSA Group sales in 2016 had been 2% less than 2015 sales. An important question one ought to ask is whether the French vehicle manufacturers have gained the most from Iran's protectionist policies.

A review of markets across the world shows that protecting domestic car manufacturers with high tariffs is common practice, yet few scholars have paid attention to the consequences of such policies. The case of automakers in the People's Republic of China (PRC) is particularly noteworthy. According to the PRC's Ministry of Commerce, imported foreign cars had a market share of 44.5% in 1985 (Kenworthy, Newman, and Gao 2015). Then, in 1992, while calling for integration of the PRC's vehicle manufacturing industry into the global economy, the PRC government levied high tariffs, as high as 220%, on car imports to stop the hard currency drain and to protect the domestic industry. It is interesting to note that American automotive manufacturers moved into the PRC in 1983, around the same time when American Motors Corporation signed a joint venture agreement, the first of its kind, with the PRC's Beijing Automotive Works. In the following years, the PRC experienced increasing tariffs on car imports and an increase in the number of joint-venture agreements with vehicle manufacturers in Japan, Germany, and the United States. By the 2000s, the PRC became the world's fastest growing vehicle manufacturer, with an annual vehicle production of 9.5 million units in 2008, up from fewer than 2 million units in the late 1990s (Tang 2009). While auto industry growth in the PRC slowed to a "stationary phase" around 2010 (Kenworth, Newman, and Gao 2015), one would agree that the PRC has integrated its auto industry while imposing drastically high tariffs on car imports.

For this study, we use a mixed oligopoly approach to analyze the true impact of high tariffs on car manufacturing. Since its introduction (Merrill and Schneider 1966), the mixed oligopoly analytical framework has been increasingly popular to study the interactions between governments and businesses in domestic and multinational markets. The model includes both private and public firms, and enables the study of the impact of a government's policies on domestic entities and their foreign competition. Thus, the analytic model became particularly popular after the collapse of the Soviet Union in the late 1980s (DeFraja and Delbono 1989, 1990). The mixed oligopoly model has been used extensively to study local markets and the impact of foreign competition on these markets (Fjell and Pal 1996; Pal and White 1998; Fjell and Heywood 2002) as well as the strategic interactions of governments when it comes to privatizing the public entities in their respective countries (Bárcena-Ruiz and Garzón 2005). Other authors have expanded the use of the mixed oligopoly framework to study governments' interactions in multinational markets, where private and public firms of different nationalities compete. They have shown that a prisoners' dilemma exists when governments privatize their respective public firms unilaterally (Dadpay and Heywood 2006).

Other authors have compared the extent of privatization in domestic markets with privatization in multinational markets to understand governments' commitments to economic co-integration and have showed that market integration actually discourages governments from privatizing their public firms (Han and Ogawa 2008). It is only in single domestic markets where governments privatize their public firms without relinquishing control. However, when public firms enter international mixed markets, the privatization becomes possible only as a coordinated effort. Recent studies have investigated the impact of privatization on demand boosting (Han and Ogawa 2012), the consequences of the presence of foreign investors in privatized firms (Lin and Matsumara 2012), and the mechanism of efficiency improvement relating to partial privatization (Chen 2017). However, privatization is not the only way for governments to interact strategically with each other and with foreign businesses.

Upon reviewing the impact of subsidization on the market equilibrium in the presence of output subsidization, some authors have found that the optimal output subsidy is identical, and profits, output, and social welfare are also identical irrespective of the role the public firms play in the market (Poyago-Theotoky 2001). A government might use subsidization strategically in order to deny foreign competition any benefit from the government's decision to liberalize the industry or to integrate the domestic market (Dadpay 2010 and 2014). Governments can interact using both privatization and subsidization in mixed international markets, and public firms respond to foreign governments' and businesses' decisions to protect both domestic consumers' and producers' surpluses (Dadpay 2014). A public firm would lower its output to compensate for a fall in prices when a foreign firm enters the market, suggesting that governments can use both subsidization and privatization to control the economic co-integration process to maximize the social welfare.

Using the interaction of two countries regarding strategic choices on privatization policy in an international mixed market under an open economy, other authors have suggested that the degree of privatization depends on trade policy and the level of international competition (Lee, Xu, and Chen [2013]). In addition, Tcha and Takashi (2003) utilize a partial equilibrium model to show that globalization of the world auto market will dampen prices in the Australian automotive industry. They conclude that, thus increasing the role of tariff rates increases in determining governments' success in ensuring the social welfare of their respective communities.

However, few authors have addressed governments' incentive to use tariffs to control economic co-integration. As discussed earlier, we find particularly intriguing the role of protectionist policies in the car manufacturing industry. In this study, we apply a mixed oligopoly analytical framework to analyze the interaction between government-imposed tariffs and foreign firms' incentives to form joint ventures with domestic producers.

The rest of the paper is organized as follows. In Section II, we introduce the model to capture a domestic market where a joint venture is present. In Section III, we analyze our findings and compare them with the international mixed market for an open economy. In Section IV, we offer our discussion of incentives for economic co-integration using high tariffs as a strategic tool. In Section V, we present our conclusions and directions for future research.

## 2. MODEL

In the first scenario, we consider an open economy with no tariff. In this economy, there is a domestic market with one domestic public firm maximizing social welfare,  $m$  domestic firms, and  $n$  foreign firms, maximizing their respective profits.

We assume that all firms produce a homogenous product. We will continue following the literature by using a quadratic cost function in mixed oligopoly analysis, since it offers a linear marginal cost and is a realistic model to capture a firm's decision-making in the real world (Fjell and Heywood 2002; Dadpay and Heywood 2006; Lin and Matsumara 2012; Lee, Xu, and Chen 2013; Chen 2017). All firms have identical quadratic cost functions, since they produce a homogenous product:

$$C(q) = \left(\frac{1}{2}\right)k * q^2 + f \quad (1)$$

There is a fixed cost  $f$  and a linear marginal cost  $k*q$ , where  $k > 0$  is a constant. This specification of costs represents increasing marginal costs.

Let  $q_o^d$  be the output of the public domestic firm,  $q_i^d$  be the output of a private domestic firm ( $i = 1, \dots, m$ ), and  $q_j^f$  be the output of a foreign private firm ( $j = 1, \dots, n$ ). We assume a normalized linear demand:

$$P = a - q_o^d - \sum_{i=1}^m q_i^d - \sum_{j=1}^n q_j^f \quad (2)$$

In an open economy with no tariffs, domestic private firms and foreign ones have the same profit functions:

$$\pi_i^d = P * q_i^d - \left(\frac{1}{2}\right)k * q_i^{d^2} - f \quad (3)$$

$$\pi_j^f = P * q_j^f - \left(\frac{1}{2}\right)k * q_j^{f^2} - f \quad (4)$$

Domestic public firms maximize social welfare given by the following function:

$$W_d = CS_d + \sum_{i=1}^m \pi_i^d + \pi_o^d \quad (5)$$

If all these firms maximize their objective functions simultaneously in a Nash–Cournot game by choosing their output, in the absence of tariffs or any joint venture, both domestic and private firms produce the same output. The equilibrium values for domestic and foreign private firms are:

$$q_i^{d*} = q_j^{f*} = \frac{ak}{k^2 + k(m+n+2) + n+1} \quad (6)$$

And the domestic public firm will produce:

$$q_o^{d*} = \frac{a(k+n+1)}{k^2 + k(m+n+2) + n+1} \quad (7)$$

With total output:

$$Q_{st}^* = \frac{a[k(m+n+1) + (n+1)]}{k^2 + k(m+n+2) + n+1} \quad (8)$$



In the second scenario, the domestic government levies tariffs on foreign competition. As a result, both the foreign private firms' profit functions and the domestic public firm's objective function change. Foreign private firms' profit functions include the cost of tariffs, which is levied by the domestic government:

$$\pi_j^f = P * q_j^f - \left(\frac{1}{2}\right) k * q_j^{f^2} - f - t * q_j^f \quad (9)$$

The domestic social welfare function changes too:

$$W_d = CS_d + \sum_{i=1}^m \pi_i^d + \pi_o^d + t * \sum_{j=1}^n q_j^f \quad (10)$$

Now domestic private firms' outputs differ from foreign private firms' outputs. Domestic private firms will produce:

$$q_i^{d*} = \frac{ak+nt}{k^2+k(m+n+2)+n+1} \quad (11)$$

While foreign private firms will produce:

$$q_j^{f*} = \frac{(a-t)(k+1)^2 - a(k+1) - tkm}{(k+1)[k^2+k(m+n+2)+n+1]} \quad (12)$$

And the domestic public firm will produce:

$$q_o^{d*} = \frac{a(k+1)(k+n+1) - mnt}{(k+1)[k^2+k(m+n+2)+n+1]} \quad (13)$$

With total output:

$$Q_{st}^* = \frac{a[k(m+n+1)+(n+1)] - nt(k+1)}{k^2+k(m+n+2)+n+1} \quad (14)$$

Note that the introduction of tariffs reduces the equilibrium total output. The total output with tariff presented in equation (14) is less than the total output without tariff in equation (8).

Next, we will look into the scenario where a joint venture is introduced into the market. This means a foreign business acquires shares in one of the local domestic firms. There are two options: one is to acquire shares in the public domestic firm, as permitted by the domestic government. There is mounting evidence that governments do not want to give away control of their public entities in the presence of foreign competition. The second option, which is more likely, is for foreign manufacturers to join domestic private producers to form joint ventures. This approach means that the foreign business that starts the joint venture will not seek to export to the domestic country anymore. Therefore, there will be one less foreign private firm,  $n-1$ , and one less domestic private firm,  $m-1$ . Instead there will be a joint-venture firm, with its profit divided among foreign and domestic investors. The joint-venture firm profit function is the same as a domestic one, since it is not subjected to tariffs or taxes:

$$\pi_v^d = P * q_v^d - \left(\frac{1}{2}\right) k * q_v^{d^2} \quad (15)$$

Thus, the total output in the market will be:

$$Q = q_o^d + q_v^d + \sum_{i=1}^{m-1} q_i^d + \sum_{j=1}^{n-1} q_j^f \quad (16)$$

Thus, demand will be:

$$P = a - q_o^d - q_v^d - \sum_{i=1}^{m-1} q_i^d - \sum_{j=1}^{n-1} q_j^f \quad (17)$$

The objective function of the domestic public firm is to maximize the domestic social welfare, which includes consumer surplus and domestic producers' surplus, which includes the domestic share of profits in the joint venture:

$$W_d = CS_d + \sum_{i=1}^{m-1} \pi_i^d + \pi_o^d + \alpha \cdot \pi_v^d + t * \sum_{i=1}^{n-1} q_j^f \quad (18)$$

where  $CS_d$  is domestic consumers' surplus:

$$CS_d = 0.5(q_o^d + q_v^d + \sum_{i=1}^{m-1} q_i^d + \sum_{j=1}^{n-1} q_j^f)^2 \quad (19)$$

and  $\alpha$  is the domestic investors' share of the joint venture.

When firms move to maximize their objective functions, the domestic public firm is setting its output to maximize a social welfare function where the consumers' surplus is based on all of the output by the joint venture, while its producers' surplus includes only a portion of the profit generated by the joint venture. However, the joint venture is still a domestic private firm that is not paying tariffs. Thus, its equilibrium output will be the same as other domestic private firms:

$$q_i^{d*} = q_v^{d*} = \frac{ak+(n-1)t}{k^2+k(m+n+1)+2n-\alpha} \quad (20)$$

While foreign private firms produce:

$$q_j^{f*} = \frac{(a-t)(k+1)^2 - a - tmk - t(1-\alpha)}{(k+1)[k^2+k(m+n+1)+2n-\alpha]} \quad (21)$$

and the domestic public firm will produce:

$$q_o^{d*} = \frac{a(k+1)(k+n+1-\alpha) + t[(m+n-1) - mn - \alpha(n-1)]}{(k+1)[k^2+k(m+n+1)+2n-\alpha]} \quad (22)$$

with total output:

$$Q_{st}^* = \frac{a[k(m+n+1)+2n-\alpha] - t(k+1)(n-1)}{k^2+k(m+n+1)+2n-\alpha} \quad (23)$$

The new equilibrium can be used to measure the social welfare impact of imposing tariffs while allowing joint ventures into the domestic market. In the next section, we investigate the aftermath of these policies imposed by the government.

### 3. ANALYSIS

From Iran to the PRC, domestic governments claim that they levy tariffs to protect the domestic industry. However, a closer look shows that when tariffs are imposed a foreign firm is actually encouraged to form a partnership with a domestic private firm, sharing the profit. For one thing, it is clearly better to make a profit instead of paying tariffs. In this section, we review the dynamics of tariffs and the impact they have on the equilibrium values of domestic and foreign firms' outputs as well as the profit foreign investors will receive from the joint-venture firm.

**Proposition 1.** *Under tariffs, a domestic private firm produces more than a foreign private firm with the same technology.*

**Proof.** Under both scenarios, levying tariffs without a joint venture and levying tariffs with a joint venture, the equilibrium output for a domestic private firm is more than the equilibrium output for a foreign private firm. This can be examined by looking at the difference of these equilibria, which can be estimated by subtracting equation (12) from equation (11) for the tariff without joint venture and subtracting equation (21) from equation (20) for when a joint venture is shaped. The difference between the equilibrium output of a domestic private firm and that of a foreign private firm when tariffs are levied is:

$$q_i^{d*} - q_j^{f*} = \frac{t}{k+1} > 0 \quad (23)$$

When a joint venture is formed, the difference will be a bit more complicated, since shaping the joint venture reduces the number of private domestic and private foreign firms present in the market. However, the expression remains positive for all potential values of structural parameters:

$$q_i^{d*} - q_j^{f*} = \frac{k^2 + k(m+n+1)t + (n+1)t - ak - \alpha t}{k^3 + k^2(m+n+2) + k(m+3n+1) + (1-\alpha)k + 2n - \alpha} \quad (24)$$

Reviewing the interaction between tariffs and private firms' output reveals an intriguing relationship. Increasing tariffs, as done in the PRC in the 1990s, reduces imports from foreign manufacturers and increases the domestic private firms' production. However, the domestic public firm decreases its output in response to an increase in tariff rate.

**Proposition 2.** *Increasing the tariff rate reduces the output of the foreign private firm and that of the domestic public firm while increasing the domestic private firm's output.*

**Proof.** We estimate the derivative of equilibrium values for these firms' outputs. For a domestic public firm based on equation (22), we have the following expression, which is always negative for our structural parameters:

$$\frac{\partial q_o^{d*}}{\partial t} = - \frac{(n-1)(m-1+\alpha)}{(k+1)[k^2 + k(m+n+1) + 2n - \alpha]} < 0 \quad (25)$$

Writing the derivative of a domestic private firm's equilibrium output based on equation (20), we have:

$$\frac{\partial q_i^{d*}}{\partial t} = \frac{(n-1)}{k^2 + k(m+n+1) + 2n - \alpha} > 0 \quad (26)$$

And for the foreign private firm using equation (21), the following expression is derived:

$$\frac{\partial q_j^{f*}}{\partial t} = -\frac{(k+1)^2 + mk + (1-\alpha)}{(k+1)[k^2 + k(m+n+1) + 2n - \alpha]} < 0 \quad (27)$$

Equation (27) is negative for all the values of the structural parameters.

The net effect of increasing the tariff rate is measured by the total output available to domestic consumers. It is interesting to note that increasing the tariffs reduces the total output available in the domestic market, notwithstanding how they are structured. This can be checked by looking at how the equilibrium of total output changes with respect to changes in the tariff rate.

**Proposition 3.** *Increasing the tariff rate reduces the total output available in the market.*

**Proof.** Writing the derivative of the total output equilibrium value as given by equation (14) when there is not a joint venture and equation (23) when there is a joint venture, it is easy to see that the expressions are always negative, as demonstrated by equations (25) and (26).

$$\frac{\partial Q_{st}^*}{\partial t} = \frac{-n(k+1)}{k^2 + k(m+n+2) + n+1} < 0 \quad (25)$$

$$\frac{\partial Q_{st}^*}{\partial t} = \frac{-(n-1)(k+1)}{k^2 + k(m+n+1) + 2n - \alpha} < 0 \quad (26)$$

Even when a joint venture is shaped, an increasing tariff rate means a fall not only in the output of a foreign private firm but in the total output. This is because the domestic public firm reduces its output to increase the equilibrium prices in the domestic market; thus it maximizes the social welfare by increasing the producers' surplus, not by increasing the consumers' surplus. The consumers and not the producers will pay the cost of market integration in this case.

A foreign private firm will have the incentive to join a domestic firm not only because it will allow it to produce a larger quantity, but also because it means that instead of paying tariffs, it will receive profits. To scale the profit a foreign private firm makes from forming a joint venture, we recall that the foreign partner of the joint venture receives  $(1 - \alpha)\pi_v^d$  as its share of profits. Using the equilibrium values described in equations (20) through (22), the equilibrium value of the foreign share of joint venture profit is:

$$(1 - \alpha)\pi_v^{d*} = (1 - \alpha) \frac{(0.5k+1)[ak+t(n-1)]^2}{[k^2 + k(m+n+1) + 2n - \alpha]^2} \quad (27)$$

Reviewing equation (27), we cannot help noticing that an increase in tariffs by rising tariff rates will increase the joint-venture profit and thus increase the foreign firm's share of the profit. In other words, the foreign investors of the joint venture benefit from the domestic government's protectionist policies.

**Proposition 4.** *Increasing the tariff rate increases the joint-venture firm's profits and thus increases the profit its foreign investors receive.*

**Proof.** Taking the derivative of equation (27) with respect to tariff rates yields the following:

$$\frac{\partial (1-\alpha)\pi_v^{d*}}{\partial t} = (1 - \alpha) \frac{(k+2)(n-1)[ak+t(n-1)]}{[k^2 + k(m+n+1) + 2n - \alpha]^2} \quad (28)$$

Equation (28) is positive for all of the values of the structural parameters.

It must be noted that as the tariff rate increases, the joint-venture firm's profits increase more steeply, which means foreign investors also receive a larger profit because of the increase in tariff. The domestic government's efforts to create trade barriers by imposing high tariffs on imports actually result in bigger incentives for foreign investors to invest in the domestic industry. In reality, it looks like tariffs serve as a catalyzer of market integration by motivating foreign firms to invest in local industries.

## 4. DISCUSSION

The facts and observations from markets across the world support our findings, particularly in Iran, where the automotive industry accounts for 10% of Iran's GDP and 4% of the workforce. In 2009, Iran ranked fifth in car production growth, standing next to the PRC; Taipei, China; Romania; and India. In 2017, Iran ranked 18th among worldwide car manufacturers. The fact is that despite strict economic sanctions, imposed by the United States for the past decades, Iran's car manufacturing industry has remained a viable partner for European and Asian carmakers. Joint-venture agreements have been signed between Iranian automakers such as Iran Khodro,<sup>1</sup> SAIPA,<sup>2</sup> Kerman Motor,<sup>3</sup> and their European and Asian counterparts to produce cars under license. The Iranian vehicle manufacturing industry produces a variety of vehicles: Peugeot (France), Renault (France), Suzuki (Japan), Hyundai (Republic of Korea), Cerato (Republic of Korea), and Lifan (the PRC). In 2018, the industry produced 1.5 million units of vehicle. Despite promises to eliminate or reduce tariffs on car imports, the Iranian government continues to levy heavy tariffs on cars. Several reasons have been offered, including the need to protect Iranian consumers. However, in reality, Iranian auto manufacturers sell their vehicles at prices that are significantly higher than their cost. According to a report published by the Iranian *Ta'adol Daily* based on statistics from Iranian automakers, the gap between car prices and the cost of production varies from 30% to 80%, illustrating a comfortable profit margin. We might conclude that despite sanctions, Iran has successfully utilized tariffs to create a large enough profit margin to attract foreign investors and to encourage joint-venture production of foreign cars.

Glancing across automobile manufacturing in the PRC yields similar results. According to Tang (2009), American vehicle manufacturers such as Chrysler and General Motors (GM) have been actively present in the PRC's automobile manufacturing industry despite tariffs. GM established its first joint venture in the country in 1997, and by 2009 it had invested in nine joint ventures across the PRC, prompting the company to plan to move its international headquarters from Detroit, Michigan, to Shanghai, PRC. According to the latest report in the first quarter of 2019, GM has delivered 813,973 vehicles in the PRC. American car manufacturers are focusing increasingly on the PRC's markets and using the PRC as a base of their global operations. This economic integration has taken place despite high tariffs and government policies in the PRC to protect local industries and domestic producers. We have shown that tariffs do not protect domestic businesses, but they create and increase profits in such a way that foreign investors cannot ignore them. The actual impact of tariffs in both Iran and the

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<sup>1</sup> Iran Khodro, branded IKCO, was founded by Iran's pioneering entrepreneur Ahmad Khayami in 1962.

<sup>2</sup> SAIPA is the abbreviation of Société Anonyme Iranienne de Production Automobile, founded in 1965 to assemble Citroëns under license with 75% Iranian ownership.

<sup>3</sup> Kerman Motor Company (Limited) was established in February 1995, starting its activities by importing various models of Daewoo vehicles (Republic of Korea).

PRC has been foreign car manufacturers entering the market as domestic automobile manufacturers. This is certainly an intriguing phenomenon that commands our attention.

## **5. CONCLUSION**

Building on the existing mixed oligopoly literature, we investigate the impact of tariffs on foreign investors' incentives to form joint ventures with domestic entities. We find that by levying tariffs a government utilizes its public firm to increase prices further to maximize social welfare using high prices. This is translated into significantly larger profits, protected by trade barriers, which encourage foreign businesses to stop their efforts to export their products to the domestic country. Instead they form joint-venture companies with domestic firms. These firms are treated as domestic firms although they often are producing foreign products, as is the case for automobile manufacturers in Iran and the PRC. Thus, economic integration takes place not as the outcome of liberalization but in a domestic controlled way and masked as the expansion of the domestic industry.

Further studies are needed to explore the impact of environmental policies, banking regulations, and the availability of capital to promote domestic industries to be sufficiently innovative and self-reliant. We believe further research would answer questions such as whether tariffs can be treated as trade barriers when they encourage market entries using foreign direct investment. Perhaps tariffs are levied more to ensure that foreign businesses enter the domestic market, rather than denying them entry.

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