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Abstract

Parallel to tax/subsidy competition for foreign direct investment (FDI), we have recently observed the relaxation of FDI restrictions, especially in developing countries, and mixed outcomes of inward FDI. This study examines how foreign-ownership regulation affects a multinational enterprise's (MNE's) location choice under fiscal competition. Consistent with the literature, our model shows that the larger country tends to host the MNE without FDI regulation due to the market-size advantage. With FDI regulation, however, irrespective of the market-size gap, the *smaller* country can attract the MNE under certain circumstances. Interestingly, our result indicates that looser FDI regulation in the larger country can induce the MNE to choose the *smaller* country as the production location because this reduces the local (potential) partner firm's profits and directs the local firm to decline the joint venture offer.

Keywords: Fiscal competition, Location choice, Foreign direct investment, Foreign ownership regulation, Joint venture

JEL classification: F15, F13, H23, L13, L23

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1 Introduction

Given increasing globalization, governments' competition, especially among developing countries, for foreign direct investments (FDIs) has intensified. Among several policy determinants of FDI, providing tax incentives or subsidies for FDI has been extensively recognized as a significant driver. Several studies, including Hebous et al. (2011), have shown that lower corporate taxes induce more inward FDI both for greenfield FDI and cross-border mergers and acquisitions. Moreover, Azémar et al. (2007) and Azémar and Dharmapala (2019) showed the significant impact of a tax incentive, specifically a tax-sparing provision, on inward FDI into developing countries from developed countries. Although attracting inward FDI is expected to benefit a host country in several ways, the worldwide trend of lowering taxes to attract multinational enterprises (MNEs) has been criticized as "harmful tax competition" in OECD (1998) because less tax revenue leads to lower public-good provision.[1] Therefore, analyzing tax competition is critical for a proper policy discussion in the context of international taxation.[2]

Despite the growing literature on fiscal competition for FDI, one important but overlooked aspect is "joint ventures (JVs)" as an entry mode into foreign countries. According to Raff et al. (2012), 38.6% of the Japanese MNEs in their data sample were in the form of JVs. In addition, we can see many examples of JVs in ASEAN (2021). As the JV is established only when all firms in the JV contract reach an agreement, tax incentives can affect local firms' incentives to accept JV offers from foreign MNEs. This indicates that cumulative knowledge cannot apply to non-negligible cases of FDIs, and whether the mechanisms in the literature hold even when we consider JVs is unclear.

Indeed, the fact that we observe many JVs in reality can be due to FDI regulation. For example, some developing countries set an upper limit on foreign ownership when MNEs invest in them. China limited the foreign-capital investment ratio to up to 50% of total investment. Thus, with FDI regulation such as foreign-ownership regulation, foreign firms must establish JVs with local firms as subsidiaries.

Recently, however, such a requirement has been relaxed or eliminated and its impact on inward FDI has been mixed. It was announced that China would eliminate the equity-ratio requirement in the country's automobile industry in 2022, and a German car manufacturer, Volkswagen, raised its equity ratio from 50% to 75%.[3] Following the announcement of the removal of foreign-ownership

[1] In addition to an increase in supplies, numerous other benefits from hosting an MNE have been pointed out. See Chapter 7 of Navaretti and Venables (2020) for a summary of the effects on host countries.

[2] The worldwide trend of lowering taxes for FDI has been discussed since the late 1990s, when the Organisation for Economic Co-operation and Development (OECD) summarized a report titled "Harmful Tax Competition".

[3] See `https://www.globaltimes.cn/page/202202/1252070.shtml`.

OECD Countries	1997	2003	2010	2020	Non-OECD Countries	1997	2003	2010	2020
Australia	0.200	0.175	0.075	0.080	Argentina	0.000	0.000	0.000	0.100
Belgium	0.135	0.023	0.023	0.023	Brazil	0.025	0.025	0.025	0.025
Canada	0.110	0.110	0.110	0.095	China	0.379	0.360	0.247	0.071
Finland	0.150	0.150	0.009	0.009	Egypt	0.015	0.015	0.005	0.005
Greece	0.015	0.015	0.000	0.000	India	0.237	0.082	0.048	0.035
Hungary	0.050	0.000	0.000	0.000	Indonesia	0.160	0.143	0.085	0.147
Iceland	0.112	0.112	0.112	0.112	Malaysia	0.360	0.126	0.007	0.007
Korea	0.280	0.005	0.000	0.000	Philippines	0.128	0.078	0.068	0.068
Latvia	N.A	0.020	0.005	0.005	Russia	0.233	0.233	0.092	0.163
Mexico	0.140	0.103	0.103	0.103	South Africa	0.060	0.060	0.010	0.010
New Zealand	0.200	0.200	0.200	0.190	Thailand	0.175	0.091	0.091	0.066
Poland	0.050	0.000	0.000	0.000	Viet Nam	0.620	0.250	0.107	0.025
Switzerland	0.075	0.075	0.000	0.000					
Turkey	0.200	0.200	0.000	0.000					
United Kingdom	0.023	0.000	0.000	0.000					
OECD Average	0.052	0.035	0.018	0.017					

Table 1: Indices of FDI regulation

restriction in 2018, a United States (US) electronic vehicle manufacturer, Tesla, was the first wholly-owned foreign automaker in China.[4] However, a car manufacture headquartered in the Netherlands, Stellantis, ended its JV with a Chinese automobile group, Guangzhou, and determined to supply Jeep into the Chinese market by imports.[5] Thus, the effects of FDI deregulation on firms' location choice is not obvious.

As the trend of relaxing FDI regulation is observed globally, understanding its impacts on MNEs' location choice and its welfare effects is essential for proper policy discussions. Table.1 shows a variation in the FDI regulatory restrictiveness index for the manufacturing sector in some countries.[6] The index value ranges from zero to unity, with a higher value representing tighter FDI regulation. The declining trend in the index values over the years indicates that these countries have relaxed their FDI restrictions to some degree. Despite the coexistence of changes in policies on inward FDIs, this study investigates how FDI regulation affects an MNE's location choice and whether FDI regulation is desirable.

[4]See `https://www.globaltimes.cn/content/1176038.shtml`.

[5]See `https://www.reuters.com/business/autos-transportation/stellantis-announces-termination-jeep-venture-with-chinas-gac-2022-07-18/`.

[6]The indices are computed by OECD and are accessible from `https://www.oecd.org/investment/fdiindex.htm`. The index considers four main types of restrictions: foreign-equity limitations, screening or approval mechanisms, restrictions on the employment of foreigners as key personnel, and operational restrictions such as restrictions on branching and on capital repatriation or on land ownership. We drop some OECD countries such as the US and Japan because their indices have either remained unchanged or have equaled to zero over the years.

1.1 Preview of the model and results

Given the importance and drawbacks described above, this study revisits fiscal competition for FDI by incorporating FDI regulation, that is, foreign-ownership regulation. Based on Bjorvatn and Eckel (2006), we construct an international duopoly model in which two countries in the same region compete over a productive foreign MNE outside the region through a lump-sum tax/subsidy. The two countries differ in market size. Furthermore, an incumbent local firm exists in the larger country and supplies its goods only to the local market, whereas the MNE supplies its goods to the host country and others via exports. Moreover, and as the focus of the study, the government in the larger country may impose FDI restrictions on the share of foreign capital for some political reasons, such as security purposes or the protection of local firms.

Without FDI restrictions, we find that the larger country wins the fiscal competition when the market size is larger than a certain threshold, whereas, otherwise, the smaller country attracts the MNE. The result is consistent with the literature and is widely known as the trade-off between market-size and market-competition effects. Because having a subsidiary in the larger country benefits the MNE in terms of zero transportation costs for the larger market, whereas the establishment of its subsidiary in the smaller country without any local firms results in monopoly profits without transportation costs, the MNE's location choice depends on the triplet of technological gap, market-size differentials, and the amount of the transportation costs.

Especially, irrespective of the market-size gap, the MNE always chooses the larger country when the technological gap between it and the local firm is wide and the transportation costs within the region are low. Under a wide technological gap, the government in the larger country has a stronger incentive to attract the MNE to increase consumer surplus, and thus its most generous fiscal policy is a subsidy.

With FDI regulation, our model shows other location patterns in which the *smaller* country attracts the MNE irrespective of the market-size gap in the other two situations. First, with strict FDI regulation, the smaller country wins the fiscal competition when technological differences and transportation costs are sufficiently small. In the presence of FDI regulation, the MNE needs to form a JV to enter the larger country, and the new entity operates as a monopolist in the country. Thus, if the local firm has high technology and its supplies to the market are potentially large, attracting the MNE in the form of a JV hurts its consumers and thus the government's fiscal policy is likely to be a tax rather than a subsidy. From the viewpoint of the smaller country without local firms, attracting the MNE simply increases consumer surplus and its government is ready to offer a subsidy. Thus,

the set of fiscal policies induces the MNE to locate in the smaller country.

Second and interestingly, the smaller country attracts the MNE if the level of FDI regulation is sufficiently *loose*. This is because the local firm declines the JV offer by the MNE in such a case. Under loose FDI regulation, the MNE's ownership ratio is larger, and more of the JV's profits accrue to the MNE and less profits to the local firm. Thus, the local firm can earn more profits by declining the JV offer and keeping its rival firm away from the larger country. At first glance, this result is counterintuitive because one can expect looser FDI regulation to encourage the MNE to locate in the country that is consistent with the anecdotes above. However, our result indicates that such a looser FDI regulation may keep the MNE away from the country, which is in line with the story of Stellantis and Guangzhou. Therefore, although attracting an MNE benefits the host country and the government has an incentive for inward FDI, deregulation of foreign ownership restrictions can backfire.

Furthermore, we also explore the welfare effect of FDI regulation. It will be shown that, given the MNE's location in the larger country, the mitigation of FDI regulation decreases its welfare when the degree of FDI regulation is at an intermediate level. This is because mitigated FDI regulation from an intermediate level lowers the local firm's profits and thus fiscal policy should be more generous, which lowers welfare in the larger country because some of the generous subsidy accrues to the MNE. Therefore, strict FDI regulation maximizes welfare in the larger country.

It is notable that whether FDI regulation benefits the larger country given the MNE's location there depends on the technological gap. When the technological gap is narrow, having the MNE in the form of a JV increases the JV's market power and thus FDI regulation decreases the country's welfare. However, when the technological difference is large, FDI regulation is desirable for the larger country because the local firm has inferior technology and a JV using the MNE's superior technology reduces production-efficiency losses. These results could provide one rationale for the trend that more developing countries mitigate their FDI regulation. As a wider technological gap changes the optimal FDI regulation from very strict to no FDI regulation, technological improvement in a technologically inferior country, i.e. technological transfer, can induce the larger country's government to eliminate FDI regulation.

1.2 Related literature

Our paper contributes to several strands of the literature. First, our paper is related to fiscal competition for FDI. Since Haufler and Wooton (1999) examined an international fiscal-competition

model for a monopoly foreign firm, several studies have been conducted. Based on Haufler and Wooton (1999), Ferrett and Wooton (2010) asked how a foreign firm's international ownership affects the outcomes of fiscal competition and concluded that the firm's location choice and tax/subsidy offer were independent of the distribution of the ownership. However, with local firms, a firm's ownership structure influences its strategies; thus, our paper provides new insights into the relationship between fiscal competition and a change in a firms' strategy due to a change in ownership distribution.

Moreover, recent developments in the literature have introduced interactions between firms since Bjorvatn and Eckel (2006) constructed an international duopoly model and showed that the market-size difference and transportation costs are critical determinants of which country wins the fiscal competition. Some papers have considered different market-competition structures, such as differentiated products (Ma and Wooton, 2020), the existence of a public local incumbent (Amerighi and De Feo, 2017), and network goods (Mukunoki and Okoshi, 2023), while others have introduced different environments of the country relationship, such as more than three countries (Haufler and Wooton, 2006, 2010) and hub-and-spokes countries (Darby et al., 2014). In contrast to these papers, we incorporate another policy-related variable, FDI regulation, which has been overlooked.

Second, this paper contributes to FDI policies with regulation. Fatica (2010) introduced partial foreign ownership when a foreign firm enters a host country and showed its incentive for a JV rather than greenfield FDI if the fixed costs of greenfield FDI were high. Qiu and Wang (2011) investigated a host country's optimal policy that limits the share of profits accruing to a foreign firm, and concluded that the optimal policy is to impose FDI regulation under certain market conditions such as market-competition intensity and the gap between firms' technologies. Cai and Karasawa-Ohtashiro (2021) explored the optimal local-equity requirement by incorporating a state-owned enterprise that maximizes domestic welfare instead of its own profits. However, these papers consider the optimal FDI regulation in a two-country model with one host country, and it is impossible to consider fiscal competition between two host countries, whereas ours constructs a three-country model with two (potential) host countries.

The rest of the paper is organized as follows: Section 2 introduces our model and derives the equilibrium without FDI regulation, while section 3 derives the equilibrium in the presence of FDI regulation. Section 4 investigates the welfare effect of FDI regulation. We discuss some extensions in section 5. Section 6 concludes the paper.

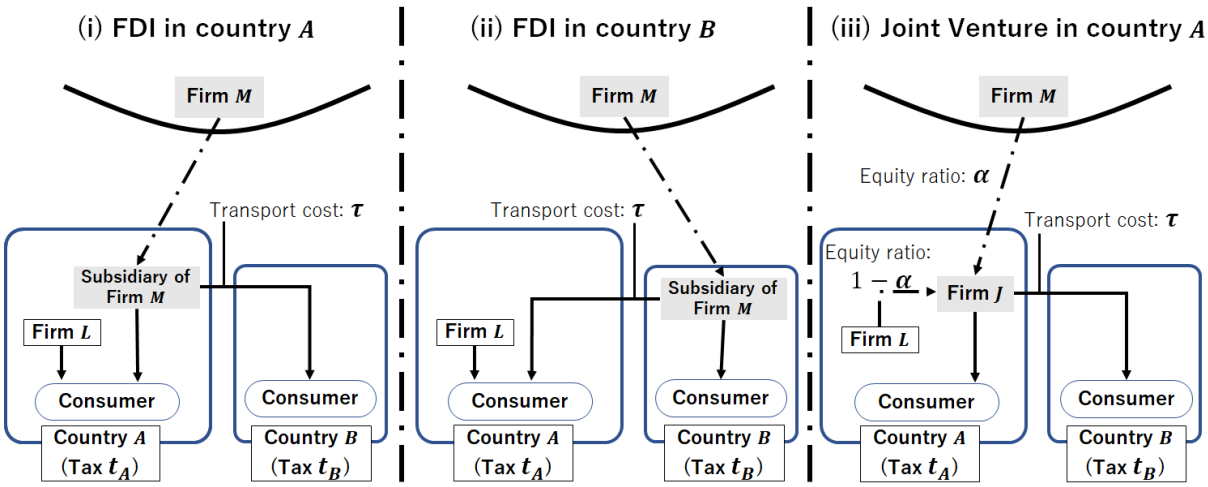

Figure 1: Model

2 Model

We consider a three-country model, as illustrated in Fig.1. There are two countries, A and B, in the same region. We assume that the two countries are developing countries and seek to attract a productive foreign firm headquartered in an industrial country outside the region. We refer to the foreign firm as a multinational firm, firm M, and transportation costs between the country and the region are assumed to be prohibitively high and supplying its goods to the region requires a production plant in the region.[7]

The two countries differ in two respects. First, the population in country A is n times larger than that in country B. Let n_i be the number of the population in country $i \in \{A, B\}$. Thus, we normalize the size of country B to unity for simplicity, so that $n_A = n > 1 = n_B$ holds. Second, following Bjorvatn and Eckel (2006), there is a local firm, firm L, only in the larger country A.

Consumers in the region share the same utility function, and a representative consumer has the following utility function:

$$u_i = q_i - \frac{q_i^2}{2} + z_i \qquad \forall i \in \{A, B\}, \tag{1}$$

where q_i and z_i are its consumption of goods in imperfect and perfect industries in country i, respectively. This quadratic utility function yields the representative consumer's inverse demand

[7]This is a standard assumption in the literature on fiscal competition for one foreign firm. It is possible to consider the case in which the MNE supplies its goods via exports if transportation costs between the foreign country and the region are sufficiently small or having one subsidiary in each country if fixed costs of FDI is small enough. However, we do not consider such cases because only few new insights can be obtained while the analysis becomes complex.

function $p_i = 1 - q_i$ and consequently the following aggregate inverse demand function:

$$Q_i \equiv n_i q_i = n_i(1 - p_i) \quad \rightarrow \quad p_i = 1 - \frac{Q_i}{n_i},$$

where Q_i is the aggregate consumption of the good in the imperfect sector in country i.

The consumers have (potentially) three sources of income. First, each consumer owns an initial income I which is assumed to be sufficient for the positive consumption of both imperfect and perfect industries. Second, we assume, following the literature, that the local firm is owned by residents in the country and firm L's profits (Π_L) are equally distributed to the local residents in country A. Finally, if a country successfully hosts the MNE with a tax on FDI, the government uniformly distributes the tax revenue to the consumers in the country. By contrast, if a country needs to offer a subsidy to attract the MNE, the government collects tax from its consumers to finance the fiscal policy. Overall, the budget constraint for the representative consumer in each country is expressed by the following:

$$I + \frac{\Pi_L}{n} + \lambda \frac{t_A}{n} \leq z_A + p_A q_A \tag{2}$$

$$I + (1 - \lambda) t_B \leq z_B + p_B q_B, \tag{3}$$

where λ takes unity if country A is the host country and zero if country B hosts the MNE.

Thus, by using eqs.(1) to (3), the utility-maximization problem yields the following welfare functions:

$$W_A = n u_A = \frac{n}{2}\left(\frac{Q_A}{n}\right)^2 + \Pi_L + \lambda t_A + nI, \text{ and } W_B = u_B = \frac{(Q_B)^2}{2} + (1 - \lambda) t_B + I. \tag{4}$$

Governments design their fiscal policy to maximize their own social welfare defined by eq.(4). Each government designs a lump-sum fiscal policy, which we denote by t_i. t_i can be either positive or negative: a positive t_i is a tax while a negative one represents a subsidy.[8] As explained above, the investment tax revenue is uniformly distributed to the consumers in the country, whereas the investment subsidy is financed by a tax on the consumers.

In addition to the fiscal policy, firm M's entry mode depends on FDI regulation in country A, which is the main focus of the paper and is analyzed in the next section. Government A may impose some degree of FDI restriction on foreign capital for some purposes, such as security reasons, and

[8]The assumption of the lump-sum fiscal policy is standard in the literature and realistic because fiscal policies to attract FDI are often in the form of a one-shot or short-term tax/subsidy incentive scheme.

firm M must form a JV, firm J, as its subsidiary in country A. Following Ishikawa et al. (2009), we introduce an exogenous foreign-ownership regulation parameter $\alpha \in (0,1)$, which means that firm M owns $\alpha(>0)$ percent of firm J at most, and firm L owns $1-\alpha$ percent of firm J. In other words, firm M's equity ratio is α percent and α percent of firm J's profits accrue to firm M, whereas firm L obtains the remaining profits. Thus, α rises as government A loosens it ownership restrictions. In this paper, we assume that this parameter is exogenously given and government A cannot control it for welfare maximization due to some political and/or security reasons.[9] Note that, firm M always establishes a wholly-owned subsidiary when it chooses to locate in country B because no local firm exists in country B.

Our model considers two types of industries. One industry is characterized by perfect competition. In this industry, perfectly competitive firms produce goods and we use it as a numéraire industry. The other type of industry is the focus of our study and is imperfectly competitive in the region, which is described in detail below.

Firms M and L produce homogeneous goods with different levels of technology. Firm M produces a homogeneous good with superior technology at the zero marginal cost ($c_M = 0$), whereas firm L produces goods with inferior technology and must incur a marginal cost $c_L = c > 0$.[10] For simplicity, intra-regional trade is assumed to be conducted only by firm M because firm L has inferior technology and cannot earn sufficient profits to cover the relatively high fixed cost of exports. Furthermore, exports between countries A and B entail a transportation cost, τ, per unit.[11] The existence of transportation costs in our model creates a trade-off for firm M on location choice: earning higher profits in a larger market versus earning higher profits from a monopolized market in country B.

Before solving the model, we argue for two important assumptions about the formation of a JV. First, a JV uses firm M's superior technology and produces goods at a zero marginal cost $c_J = 0$. As firm M's superior technology is available with firm-specific intangible assets such as patents, production without patents is impossible and firm M's negotiation power is quite strong. Thus, we assume that firm M holds a maximum level of equity α and we do not incorporate the negotiation process for the optimal ownership level α. Similarly, and for the purpose of comparing our analysis with that in the literature, firm M prefers a wholly owned enterprise to a partially owned one. A possible reason is the weak intellectual property protection in developing countries. As firm J

[9] We argue the optimal α in section 4.

[10] Ferrett and Gravino (2021) also introduces asymmetry in the marginal costs of production between the local firm and multinational firm and shows that technological spillover can be a factor in where the multinational firm locates.

[11] Throughout the analysis, we focus on the case in which both firm M and firm L operate in equilibrium. This pins down the ranges of c and τ as $c \in [0, \frac{1}{2})$ and $\tau \in [0, \frac{1+c}{2} \equiv \tau^{max})$, respectively.

uses firm M's superior technology and produces its goods at zero marginal cost $c_J = 0$, the JV's profitability crucially depends on the quality of contractual enforcement.[12] Thus, the MNE fears a technology leak via the JV because a leakage of superior technology may induce more entrants and reduce firm J's profits.

We solve the following three-stage game: In the first stage, governments determine the level of tax/subsidy. Second, firm M chooses a country for the location of its production. Finally, firms simultaneously determine the amount of production. We solve the game by backward induction. To clarify the importance of FDI regulation, our analysis first examines the case without FDI regulation in the reminder of this section by considering cases (i) and (ii) in Fig.1. The next section focuses on the case with FDI regulation by focusing on the cases (iii) and (ii) of the figure.

2.1 Without FDI regulation

As a benchmark analysis, we begin our analysis with no FDI regulation.

At the third stage, given the aggregate demand function and firm M's location in i, firms M and L maximize the following profits:

$$\Pi_M^i = p_i^i Q_{Mi}^i + (p_j^i - \tau) Q_{Mj}^i - t_i, \quad \text{and} \quad \Pi_L^i = (p_A^i - c) Q_L^i, \quad j \neq i \tag{5}$$

where Q_{Mi}^i and Q_{Mj}^i represent the amounts of supplies by firm M locating in country i to the markets in countries i and j, respectively, and Q_L^i denotes the amount of supplies by firm L when firm M invests in country i. Note that, hereafter, we use a superscript for the location of firm M and a subscript for the country where firms supply their goods. Thus, for the profit-maximization problem, we derive the following set of equilibrium outputs:

$$Q_{MA}^A = \frac{n(1+c)}{3}, \qquad Q_L^A = \frac{n(1-2c)}{3}, \qquad Q_{MB}^A = \frac{1-\tau}{2}, \quad \text{(when firm } M \text{ in } A\text{)}$$
$$Q_{MA}^B = \frac{n(1+c-2\tau)}{3}, \qquad Q_L^B = \frac{n(1-2c+\tau)}{3}, \qquad Q_{MB}^B = \frac{1}{2}, \quad \text{(when firm } M \text{ in } B\text{)}$$

[12] Property Right Alliance provides evidence that developing countries have weak protection for intellectual property rights. See `https://www.internationalpropertyrightsindex.org/`.

and the profits of firms M and L are respectively as follows:

$$\text{(Firm } M\text{)} \quad \begin{cases} \Pi_M^A &= \frac{n(1+c)^2}{9} + \frac{(1-\tau)^2}{4} - t_A, \\ \Pi_M^B &= \frac{n(1+c-2\tau)^2}{9} + \frac{1}{4} - t_B. \end{cases} \tag{6}$$

$$\text{(Firm } L\text{)} \quad \begin{cases} \Pi_L^A &= \frac{n(1-2c)^2}{9}, \\ \Pi_L^B &= \frac{n(1-2c+\tau)^2}{9}, \end{cases} \tag{7}$$

At the second stage, firm M chooses the production location to maximize its profits. Given the operating profits shown in eqs.(6), we can compute the condition under which firm M invests in country A as follows:

$$\Pi_M^A - \Pi_M^B \geq 0 \Leftrightarrow t_A \leq \widehat{t}_A^{FDI} \equiv t_B + \underbrace{\frac{4n\tau(1+c-\tau)}{9}}_{\text{Gains from } A\text{'s market}} - \underbrace{\frac{\tau(2-\tau)}{4}}_{\text{Losses from } B\text{'s market}},$$

whereas firm M invests in country B if

$$\Pi_M^A - \Pi_M^B < 0 \Leftrightarrow t_B < \widehat{t}_B^{FDI} \equiv t_A + \underbrace{\frac{\tau(2-\tau)}{4}}_{\text{Gains from } B\text{'s market}} - \underbrace{\frac{4n\tau(1+c-\tau)}{9}}_{\text{Losses from } A\text{'s market}}$$

holds. The conditions clearly mean that the MNE prefers locating in country i if government i offers t_i less than or at most equal to the threshold $\widehat{t}_i^{FDI}$.

The upper bound of t_i for firm M to locate in country i is determined by three elements. The first element is the level of the rival government's fiscal policy, which is captured by the first term of $\widehat{t}_i^{FDI}$. In addition, as locating in country i increases the profits from the host market due to the absence of transportation costs, firm M's incentive to locate in the country is stronger, which is reflected by the second term. However, locating in country i generates transportation costs for supplying goods to the market in country j and thus decreases the profits from the exporting market, which is captured by the third term.

Given the location of firm M, both governments determine their policy at the first stage. Countries A and B aim to attract firm M to maximize their welfare. Country A's welfare is given by the following:

$$W_A^A = \frac{n(2-c)^2}{18} + \frac{n(1-2c)^2}{9} + t_A + nI \text{ and } W_A^B = \frac{n(2-c-\tau)^2}{18} + \frac{n(1-2c+\tau)^2}{9} + nI, \tag{8}$$

whereas country B's welfare is,

$$W_B^A = \frac{(1-\tau)^2}{8} + I \qquad \text{and} \qquad W_B^B = \frac{1}{8} + t_B + I. \tag{9}$$

Thus, eqs.(8) to (9) provide us with the following most generous fiscal policies that each government can offer to attract firm M,

$$W_A^A \geq W_A^B \Leftrightarrow t_A \geq \underline{t}_A^{FDI} \equiv \frac{n\tau(\tau - 2c)}{6},$$
$$W_B^B \geq W_B^A \Leftrightarrow t_B \geq \underline{t}_B \equiv -\frac{(2-\tau)\tau}{8} < 0$$

Note that the sign of $\underline{t}_B$ is always negative, whereas that of $\underline{t}_A^{FDI}$ is ambiguous. Government B offers a subsidy because having firm M is always beneficial to country B due to the absence of transportation costs and an increase in consumer surplus. However, regarding $\underline{t}_A^{FDI}$, two conflicting mechanisms arise. On the one hand, attracting firm M increases consumer surplus in country A because transportation costs do not exist. On the other hand, the absence of transportation costs decreases firm L's profits. As firm L earns higher profits when firm M locates in country B and transportation costs are large, government A is not eager to attract firm M and thus the most generous fiscal policy is likely to be a tax. Thus, $\underline{t}_A^{FDI}$ is positive and a tax when transportation costs are large and $2c < \tau < \frac{1+c}{2}$ holds, and $\underline{t}_A^{FDI}$ is negative otherwise. Note that $2c < \frac{1+c}{2}$ holds only when $c < \frac{1}{3}$ holds. Thus, if $c > \frac{1}{3}$ holds, $(\tau <)\frac{1+c}{2} < 2c$ holds and $\underline{t}_A^{FDI}$ is always negative and a subsidy. Intuitively, the most generous policy in country A is a tax if the local firm's technology is sufficiently low and transportation costs are large because the benefits from protecting firm L are large only in such a situation.

From now on, let us identify which country wins the fiscal competition for firm M. As the set of the most generous policies $(\underline{t}_A^{FDI}, \underline{t}_B)$ maximizes firm M's profits, firm M chooses country A for its production when $\Pi_M^A(\underline{t}_A^{FDI}) \geq \Pi_M^B(\underline{t}_B)$ holds; otherwise, it chooses country B. Using eq.(6), $\underline{t}_A^{FDI}$, and $\underline{t}_B$, we have the following:

$$\Pi_M^A(\underline{t}_A^{FDI}) \gtreqless \Pi_M^B(\underline{t}_B) \Leftrightarrow n \gtreqless n^{FDI} \equiv \frac{27(2-\tau)}{4(8+14c-11\tau)}.$$

Hence, which country wins the fiscal competition depends on the market-size and technology gaps as well as the level of transportation costs. More specifically, firm M tends to locate in the larger country A when the market gap is large ($n \geq n^{FDI}$), firm L's technology is sufficiently low

$\left(\frac{\partial n^{FDI}}{\partial c} < 0\right)$, or the transportation costs are low $\left(\frac{\partial n^{FDI}}{\partial \tau} > 0\right)$ because of the market advantage and subsidization under a large c and/or a small τ.

Note that firm M's equilibrium location in A irrespective of market advantages is possible if c is large and τ is small. This situation corresponds to the case in which the most generous fiscal policy in country A is providing large subsidies. Specifically, as $n^{FDI} \gtreqless 1$ holds if and only if $\tau \gtreqless \frac{2(28c-11)}{17}$, country A wins the fiscal competition irrespective of the market-size gap if $\frac{11}{28} < c < \frac{1}{2}$ and $\tau < \frac{2(28c-11)}{17}$ hold.

The result is summarized as the following lemma:

Lemma 1. (*Location of firm M*): Without FDI regulation, country A can attract firm M when (i) $\frac{11}{28} < c < \frac{1}{2}$ and $\tau < \frac{2(28c-11)}{17}$ hold or (ii) $n \geq n^{FDI}$ holds. Otherwise, country B attracts firm M.

3 FDI regulation ($0 < \alpha < 1$)

In this section, we turn to the case with FDI regulation, $\alpha \in (0,1)$. In this case, firm M must form a JV with firm L when it invests in country A whereas investment in country B is not regulated as there are no incumbent firms. Therefore, we can carry over the equilibrium outputs and profits in the previous section, when firm M chooses country B for its production location. Thus, our focus, for now, is on the situation in which firm M establishes a subsidiary in country A.

Note that when firm M forms a JV with firm L, joint profit maximization is most profitable. This means that firm J uses technology at zero marginal cost and produces monopoly output level to maximize the joint profits, $\Pi_J = p_{JA}Q_{JA} + (p_{JB} - \tau)Q_{JB} - t_A$.[13] Thus, firm J produces $Q_{JA} = \frac{n}{2}$ and $Q_{JB} = \frac{1-\tau}{2}$. As firms' allocation of profits is based on equity levels, firm M and firm L receive, respectively,

$$\Pi_M^{JV} = \alpha\left[\frac{n + (1-\tau)^2}{4} - t_A\right]$$
$$\Pi_L^{JV} = (1-\alpha)\left[\frac{n + (1-\tau)^2}{4} - t_A\right]$$

as their profits.[14]

[13] In our model, the firms produce homogeneous goods and thus the monopoly output arises. Once we consider differentiated products, a strategic interaction via joint profit maximization appears and the proportions of ownership for firms M and L are a crucial element for decisions on outputs. Although we we do not incorporate this feature in the current analysis to keep our analysis comparable with the literature, we argue substitutability of goods in Section 5.2.

[14] This specification signifies that the fiscal policy, t_A, is paid by not only firm M but also by firm L. This is natural setting because some tax reductions or subsidies last for several years after firms' entry, and an MNE and a local firm jointly receive the fiscal policy.

Similar to the analysis in the previous section, with Π_M^B of eq.(6) and Π_M^{JV}, firm M prefers to form a JV and to invest in country A if

$$\Pi_M^{JV} - \Pi_M^B \geq 0 \Leftrightarrow t_A \leq \widehat{t}_A^{JV} \equiv \frac{n + (1-\tau)^2}{4} - \frac{1}{\alpha}\left[\frac{n(1+c-2\tau)^2}{9} + \frac{1}{4} - t_B\right],$$

holds and firm M invests in country B if,

$$\Pi_M^{JV} - \Pi_M^B < 0 \Leftrightarrow t_B < \widehat{t}_B^{JV} \equiv \frac{n(1+c-2\tau)^2}{9} + \frac{1}{4} - \alpha\left[\frac{n + (1-\tau)^2}{4} - t_A\right]$$

holds. Intuitively, a higher α increases firm M's profits and magnifies firm M's incentive to locate in country A. Thus, an increase in α leads to a higher $\widehat{t}_A^{JV}$ and a lower $\widehat{t}_B^{JV}$. In addition, note that $\widehat{t}_A^{JV}$ is not equal to $\widehat{t}_A^{FDI}$ as α approaches unity because the market structure in A is different.

Note that with FDI regulation, firm L declines the offer of forming a JV with firm M if the gains from forming the JV are negative. As firm L's outside option if it declines the JV offer is Π_L^B of eq.(7), firm L accepts the JV offer if

$$\Pi_L^{JV} \geq \Pi_L^B \Leftrightarrow t_A \leq \widehat{t}_A^L \equiv \frac{n + (1-\tau)^2}{4} - \frac{n(1-2c+\tau)^2}{9(1-\alpha)}$$

holds. As firm L also needs to incur $1-\alpha$ percent of the lump-sum fiscal policy in country A, the above condition simply means that a low t_A is essential for firm L to accept the JV offer and the threshold depends on the degree of FDI regulation. Therefore, a JV can be formed only when $t_A \leq \min\left\{\widehat{t}_A^{JV}, \widehat{t}_A^L\right\}$ holds.

Given the above policy constraints, government A determines the fiscal policy in the first stage, whereas the policy decision by government B is the same as in the previous section because of the assumptions that firm L cannot export to country B and that there are no incumbent firms. In the case of FDI regulation, welfare in country A is computed as follows:

$$W_A^{JV} = \frac{n}{8} + \frac{(1-\alpha)\{n + (1-\tau)^2\}}{4} + \alpha t_A + nI. \tag{10}$$

By using W_A^B and W_A^{JV}, we can derive country A's most generous offer to attract firm M as

$$W_A^{JV} \geq W_A^B \Leftrightarrow t_A \geq \underline{t}_A^{JV} \equiv \frac{n + (1-\tau)^2}{4} - \frac{1}{\alpha}\left[\frac{n(1+16c-12c^2+8c\tau-4\tau^2) + 6(1-\tau)^2}{24}\right].$$

Similar to $\underline{t}_A^{FDI}$, the sign of $\underline{t}_A^{JV}$ is ambiguous. When a JV is established, two conflicting effects

exist. On the one hand, consumer surplus *decreases* because firm J is the only operating firm and a monopoly outcome is obtained. On the other hand, firm L's profits can increase because firm J uses technology than is superior to that of firm L and $1-\alpha$ percent of profits from country B accrue to firm L. Thus, the sign of $\underline{t}_A^{JV}$ depends on the sizes of the two effects.

Before we identify which country wins the fiscal competition, we must check whether $\underline{t}_A^{JV} \leq \min\left\{\widehat{t}_A^{JV}, \widehat{t}_A^{L}\right\}$ holds, because the inequality is essential for country A to induce firm M to form a JV. We confirm $\frac{\partial \widehat{t}_A^{JV}}{\partial \alpha} < 0$ and $\frac{\partial \widehat{t}_A^{L}}{\partial \alpha} > 0$, and thus we have a unique threshold of α such that $\widehat{t}_A^{JV}(\underline{t}_B) = \widehat{t}_A^{L}$ holds at $\alpha = \alpha^t$. Specifically, we have

$$\widehat{t}_A^{JV}(\underline{t}_B) \gtreqless \widehat{t}_A^{L} \Leftrightarrow \alpha \gtreqless \alpha^t \equiv \frac{8n(1+c-2\tau)^2 + 9(2+2\tau-\tau^2)}{8n(2-2c+5c^2-2\tau-8c\tau+5\tau^2)+9(2+2\tau-\tau^2)}.$$

When $\alpha < \alpha^t$ holds, as shown in appendix A, in equilibrium, $\underline{t}_A^{JV} \leq \widehat{t}_A^{JV} (< \widehat{t}_A^{L})$ always holds. In addition, $\underline{t}_A^{JV} \leq \widehat{t}_A^{L} (< \widehat{t}_A^{JV})$ holds when $\alpha^t < \alpha < \alpha^J (< 1)$ holds. Therefore, country A loses the fiscal competition when $\alpha^J < \alpha < 1$ holds because sufficiently large α decreases firm L's profits and firm L declines the JV offer.

From now on, we examine the condition under which country A wins the fiscal competition by considering firm M's profits under the set of the most generous fiscal policies. Suppose $0 < \alpha < \alpha^J$. As shown in appendix B, irrespective of the country-size difference, $\Pi_M^{JV}(\underline{t}_A^{JV}) < \Pi_M^{B}(\underline{t}_B)$ holds and country B can attract firm M when $\tau < \tau^B \equiv \frac{2(4+7c)-3\sqrt{1+64c-32c^2}}{22}$ under $c < \frac{5}{22}$ holds. This is because the most generous fiscal policy for government A is likely to impose a tax because joint profit maximization generates a monopoly outcome and the technological gain is small under a small τ and c.

However, we also derive results similar to those in the case without FDI regulation. First, country A wins the fiscal competition irrespective of the market-size differential, namely, $\Pi_M^{JV}(\underline{t}_A^{JV}) > \Pi_M^{B}(\underline{t}_B)$, when $\tau < \frac{22c-5}{17}$ holds under $\frac{5}{22} < c$. Moreover, if $\max\left\{\tau^B, \frac{22c-5}{17}\right\} < \tau$ holds, which country wins the fiscal competition depends also on the market-size differential as well as the transportation costs and technological difference, namely,

$$\Pi_M^{JV}(\underline{t}_A^{JV}) \gtreqless \Pi_M^{B}(\underline{t}_B) \Leftrightarrow n \gtreqless n^{JV} \equiv \frac{27(2-\tau)\tau}{\xi},$$

where $\xi \equiv -5 + 32c - 44c^2 + 56c\tau + 32\tau - 44\tau^2$. Similarly, in the case without FDI regulation summarized in lemma 1, country A has a larger market or technological advantage with low transportation costs and thus it tends to win the fiscal competition.

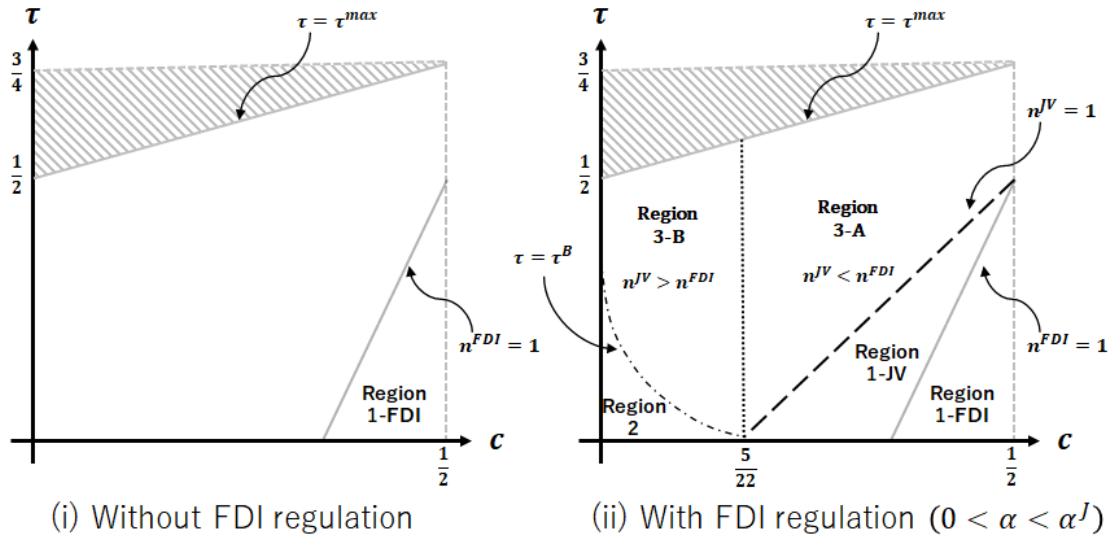

Figure 2: Location for the multinational enterprise

The above results are summarized as the following lemma:

Lemma 2. (*Location of firm M*): With FDI regulation, country A attracts firm M when $0 < \alpha < \alpha^J$, $\max\left\{\tau^B, \frac{22c-5}{17}\right\} < \tau$, and $n \geq n^{JV}$ hold. Otherwise, country B attracts firm M.

The results are illustrated in Fig.2 in the (c, τ) plane. As we focus on the case in which both firms operate in equilibrium, we consider the area below $\tau \leq \tau^{max}$. The left figure shows the case without FDI regulation. Lemma 1 shows that a larger country tends to attract FDI when $n \geq n^{FDI}$ holds. Therefore, country A always wins the fiscal competition for FDI when $n^{FDI} \leq 1 (< n)$ holds, which corresponds to the area labeled "Region 1-FDI." In the area above the line, $n^{FDI} = 1$, $n^{FDI} > 1$ holds and country A (B) wins the fiscal competition when $n \geq n^{FDI}$ ($n < n^{FDI}$) holds.

With FDI regulation, as is depicted in the right figure, additional cases are possible. First, similar to the threshold, $n^{FDI} = 1$, another threshold, $n^{JV} = 1$, is drawn with a dashed line above the solid line showing $n^{FDI} = 1$. The areas below the line represent the case in which the larger country always attracts the MNE, labeled "Region 1-JV," whereas the area above the dashed line corresponds to the case in which the equilibrium location depends on the market size. The expansion of the area in which country A successfully attracts FDI irrespective of the market-size gap is because government A's offer is likely to subsidize the JV. If firm L's technology is sufficiently low and c is large, $1 - \alpha$ percent of firm J's profits tends to be greater than firm L's profits when firm M enters country B and thus the benefits from the most generous equilibrium policy decrease.

In addition to "Region 1-JV," another dot-dashed curve represents $\tau = \tau^B$, and thus the area below the threshold is the case in which the smaller country can attract the MNE irrespective of

the market-size differential, which is labeled "Region 2." If $c < \frac{5}{22}$ holds and firm L is relatively productive, government A tends to tax the JV and reduces consumer surplus due to an increase in market power. Thus, a less generous policy discourages firm M from entering country A.

Above the thresholds, $\tau = \tau^B$ and $n^{JV} = 1$, the fiscal competition relies on the market-size gap and firm M's location is in country A if $n \geq n^{JV}$ holds; the corresponding areas are labeled "Region 3-A" and "Region 3-B." The difference between "Region 3-A" and "Region 3-B" is the order of n^{JV} and n^{FDI}: "Region 3-A" is the case in which $n^{JV} < n^{FDI}$ holds and "Region 3-B" is the case in which $n^{FDI} < n^{JV}$.[15] The intuition is the same as above: a small c (large c) leads to the most generous fiscal policy of government A as an investment tax (subsidy). Thus, with a small (large) technology gap, the likelihood of firm M's location in the larger (smaller) country increases.

Lemmas 1 and 2 immediately prove the following proposition:

Proposition 1. (Impact of FDI regulation on firm M's location): FDI regulation can induce a *smaller* country to host firm M irrespective of market size gap. Specifically, country B always wins the fiscal competition if (i) $0 < \alpha < \alpha^J$, $\tau < \tau^B$, and $c < \frac{5}{22}$ hold or (ii) $\alpha^J < \alpha < 1$ holds.

This proposition has two notable results of the fiscal competition. First, although it is well known that a larger country is more likely to host MNEs, we showed that the smaller country always wins the fiscal competition when $0 < \alpha < \alpha^J$ and $\tau < \tau^B$ or $\alpha^J < \alpha < 1$ hold. In the former case, FDI regulation weakens country A's incentive to attract firm M due to an increase in market power. Thus, this result indicates that considering a change in market structure is important when discussing fiscal competition.

More importantly, our model predicts that the deregulation of foreign ownership in country A can trigger a relocation of firm M *from country A to B*. This happens when weakening FDI regulation from $\alpha \in (0, \alpha^J)$ to $\alpha \in (\alpha^J, 1)$ under $n^{JV} < n$. As briefly explained in the Introduction, this is somewhat surprising because less strict FDI regulation seems to increase firm M's gains from location in country A and the likelihood of country A hosting the MNE is expected to increase. However, as a larger α decreases firm L's profits, firm L does not accept the JV offer by firm M, which can lead to the result that the *smaller* country hosts the MNE. This may be a rationale for the anecdotal evidence that Stellantis and Guangzhou Automobile Group ended their JV in 2022. As attracting an MNE is beneficial for social welfare, our model shows a backfiring of the deregulation of foreign-ownership restriction.

[15] Specifically, we have $n^{JV} - n^{FDI} = \frac{27(2-\tau)\tau(1-2c)(5-22c)}{4\xi(8+14c-11\tau)} \gtreqless 0 \iff \frac{5}{22} \gtreqless c$.

4 Welfare effect of FDI regulation

Thus far, we have assumed that the level of FDI regulation is exogenously given and fixed due to reasons such as security purposes. However, as shown in proposition 1, the degree of FDI regulation is a critical element for the fiscal competition and it is interesting to see how changes in α affect welfare in country A and to consider the optimal level of FDI regulation from the viewpoint of social welfare. For this aim, we introduce stage zero where government A determines the level of α to maximize its welfare.

4.1 Optimal regulation

Note that, although we used the most generous fiscal policies $(\underline{t}_A^{FDI}, \underline{t}_A^{JV}, \underline{t}_B)$ to identify the MNE's location choice, the host country does not need to offer the most generous fiscal policy. This is simply because the MNE benefits from gains from locating in the host country, either in the form of a larger market or a lack of competitors, and thus the host government must provide a slightly more generous fiscal policy than the sum of the other government's fiscal-policy benefits and gains. Specifically, in the absence of FDI regulation, the equilibrium fiscal policies for the host country are $t_A^{FDI*} = \widehat{t}_A^{FDI}(\underline{t}_B)$ and are computed as follows:

$$t_A^{FDI*} = \frac{\tau\left\{32n(1+c-\tau) - 27(2-\tau)\right\}}{72}$$

Similarly, in the presence of FDI regulation, we can derive the equilibrium fiscal policies as follows:

$$t_A^{JV*} = \begin{cases} \widehat{t}_A^{JV}(\underline{t}_B) = \frac{n+(1-\tau)^2}{4} - \frac{1}{\alpha}\left(\frac{n(1+c-2\tau)^2}{9} + \frac{2+2\tau-\tau^2}{8}\right) & \text{if } 0 < \alpha < \alpha^t \\ \widehat{t}_A^L & \text{if } \alpha^t < \alpha < \alpha^J \end{cases}$$

To see the welfare effect of α, we can confirm the following lemma: See appendix C for the proof.

Lemma 3. (Effect of change in α): Suppose a mitigation of FDI regulation that keeps firm M's location in country A. Then, we have $\frac{\partial W_A^{JV}(\widehat{t}_A^{JV}(\underline{t}_B))}{\partial \alpha} = 0$ and $\frac{\partial W_A^A(\widehat{t}_A^L)}{\partial \alpha} = -\frac{n(1-2c+\tau)^2}{9(1-\alpha)^2} < 0$. Moreover, as $W_A^{JV}(\widehat{t}_A^L) < W_A^{JV}(\widehat{t}_A^L)\Big|_{\alpha=\alpha^t} = W_A^{JV}(\widehat{t}_A^{JV}(\underline{t}_B))$ holds, welfare in country A is maximized at $\alpha \in (0, \alpha^t)$ in the presence of FDI regulation.

Intuitively, $\frac{\partial W_A^A(\widehat{t}_A^L)}{\partial \alpha} < 0$ holds because a mitigated FDI regulation decreases the local firm's profits and thus fiscal policy should be more generous, which lowers welfare in the larger country because some of the generous subsidy accrues to the MNE. Thus, as lemma 3 states, welfare in country A

under FDI regulation is maximized when $\alpha \in [0, \alpha^t)$ is set.

By comparing welfare in country A without and with FDI regulation, we can identify whether FDI regulation is desirable. Thus,

$$W_A^{JV}(\hat{t}_A^{JV}(\underline{t}_B)) - W_A^A(t_A^{FDI*}) = \frac{n(1-2c)(22c-5)}{72} \gtreqless 0 \Leftrightarrow c \gtreqless \frac{5}{22}. \tag{11}$$

Therefore, having firm M in the form of a JV is more beneficial than in the form of FDI when $c > \frac{5}{22}$ holds. Otherwise, country A's welfare under no FDI regulation is greater than that under FDI regulation. The intuition behind the result is a trade-off between higher profits for firm L and an increase in monopoly power. With a wide technology gap, firm L benefits from forming a JV by using superior technology and the opportunity for exports is substantial. However, with a narrow technology gap, consumers' losses from an increase in market power are large. Thus, FDI regulation benefits the large host country only when the local firm owns low technology and the former benefit is a dominant effect.

To summarize the above argument, we have the following proposition:

Proposition 2. (*Welfare effect of α on a large country*): Suppose a mitigation of FDI regulation that keeps firm M's location in country A. Then, the elimination of FDI regulation benefits country A when $c < \frac{5}{22}$ holds, whereas the optimal regulation is $\alpha \in [0, \alpha^t]$ when $c > \frac{5}{22}$ holds.

Proposition 2 implies that the marginal cost c is critical for the optimal FDI regulation, and thus it is important to discuss the impacts of technological improvement on the optimal level of FDI regulation. Note that we normalized the marginal cost of firm M to zero and thus we can interchangeably interpret c as the technology gap between firms M and L. Therefore, we can regard an increase in c as technological improvement in the industrial country and a decrease in c as technological improvement in the developing country A.

As in proposition 2, the optimal α lies in the range of $0 < \alpha \leq \alpha^t$ when the gap is large, whereas deregulation is the optimal policy when the technological gap is small. Thus, technological improvement in country A can trigger the elimination of FDI regulation. This can provide a new rationale why some developing countries such as China recently relaxed or eliminated their FDI regulation. Such technological improvement can be driven by, for example, technology transfer and technological spillovers.

4.2 Effects when the smaller country is the host

Finally, although country B cannot determine α, it is also important to analyze the effects of FDI regulation on country B because FDI regulation affects the most generous policy and consequently country B's welfare. As previous studies have ignored the existence of FDI regulation, we know little about whether location in a smaller country due to FDI regulation is desirable.

Similar to the previous subsection, given firm M's location in country B, we can derive the equilibrium fiscal policies as follows:

$$t_B^{FDI*} = \widehat{t}_B(\underline{t}_A^{FDI}) = \frac{\tau\{9(2-\tau) - 2n(8+14c-11\tau)\}}{36},$$
$$t_B^{JV*} = \widehat{t}_B^{JV}(\underline{t}_A^{JV}) = \frac{(2-\tau)\tau}{4} - \frac{n\xi}{72}.$$

Note that when country B hosts the MNE, the market structure in the region is the same without and with FDI regulation, and no impact on consumer surplus is observed. Thus, a change in welfare in country B is equivalent to a change in the equilibrium fiscal policy, namely,

$$W_B^{JV}(t_B^{JV*}) - W_B^B(t_B^{FDI*}) = t_B^{JV*} - t_B^{FDI*} = \frac{n(1-2c)(5-22c)}{72} \gtreqless 0 \Leftrightarrow c \lesseqgtr \frac{5}{22}. \tag{12}$$

The above equation immediately shows that FDI regulation has positive impacts on a host country when the technological gap between an MNE and a local firm is narrow, $c < \frac{5}{22}$. This is because, due to an increase in monopoly power in the case of a JV, fiscal competition is mitigated when firm L is productive and thus country B can attract firm M with a less generous fiscal policy in such cases.

The impact of FDI regulation on a small host country is the opposite to that on a large host country. In other words, whether FDI regulation is beneficial for a host economy depends on a combination of the host country and cost gap between the MNE and the local firm in the large country. On the one hand, a large technological gap means that firm L's production is inefficient and thus FDI regulation is beneficial for the larger economy. On the other hand, a small technological gap indicates that forming a JV enhances the MNE's market power and discourages the government in country A from competing against country B, which is beneficial for the smaller country B.

5 Discussion

5.1 Trade liberalization

Due to increasing globalization, it is important to explore the effect of a reduction in transportation costs.

5.1.1 Location choice

First, let us consider the effect of trade liberalization on the location choice. In the absence of FDI regulation, we have $\frac{\partial n^{FDI}}{\partial \tau} = \frac{189(1-c)}{2(8+14c-11\tau)^2} > 0$, which means that a reduction in τ lowers n^{FDI} and it is more likely that firm M will choose the larger country A as the production location. The reason is that lower trade costs reduce the benefits of locating in country A to obtain larger profits from the monopolized market and thus firm M is likely to choose the larger country A.

In the presence of FDI regulation, the opposite sign could be obtained. We easily obtain $\frac{\partial n^{JV}}{\partial \tau} = \frac{54\{28(1-c)\tau^2+(1-2c)(5-22c)\tau-(1-2c)(5-22c)\}}{\xi^2}$. As shown in appendix D, the sign of the first derivative is positive either if (i) $c > \frac{5}{22}$ holds or (ii) $c < \frac{5}{22}$ and $\frac{\sqrt{(1-2c)(5-22c)(3-2c)(39-22c)}-(1-2c)(5-22c)}{56(1-c)} < \tau < \tau^{max}$ hold. Otherwise, the sign of $\frac{\partial n^{JV}}{\partial \tau}$ is negative.

Intuitively, we can understand the above results as follows. When $c > \frac{5}{22}$ holds, firm L is highly more inefficient than firm M. Thus, government A has a stronger incentive to attract firm M and to increase firm L's profits via forming a JV and thus provides a generous fiscal policy for firm M to locate in country A. As trade liberalization also increases the profits from country B, government A's incentive to attract firm M becomes stronger. In the case of (ii), namely, when $c < \frac{5}{22}$ and $\frac{\sqrt{(1-2c)(5-22c)(3-2c)(39-22c)}-(1-2c)(5-22c)}{56(1-c)} < \tau < \tau^{max}$ hold, firm M's incentive to form a JV is strong because firm L is productive and firm M's profits from the larger market in country A is small when a JV is not formed.

However, trade liberalization increases n^{JV} and induces firm M to locate in country B. This is the case in which firm L's marginal cost is low and trade costs are small. In such a case, government A's incentive to attract firm M is weak because of an increase in firm J's market power, and consumer surplus declines. Because this loss rises as trade costs become smaller, government A's most generous policy becomes less attractive for firm M. Thus, a reduction in trade costs makes locating in country B more beneficial.

5.1.2 Equilibrium policy and welfare

As one of the central concerns about international taxation in the current economy is the possibility of a "race to the bottom," here, we explore the effect of a reduction in trade costs on the equilibrium fiscal policy. Hereafter, our analysis focuses on the case in which trade liberalization does not affect firm M's location and thus the difference between welfare without and with FDI regulation is characterized by the difference in fiscal policies. In the rest of the subsection, we consider the case in which country A hosts firm M, which is the most interesting case.[16]

First, without FDI regulation, we have[17]

$$\frac{\partial t_A^{FDI*}}{\partial \tau} = \frac{16n(1+c) - 27 - (32n-27)\tau}{72} \gtreqless 0 \iff \frac{16n(1+c)-27}{32n-27} \gtreqless \tau.$$

This implies that a reduction in trade costs tightens the equilibrium fiscal policy when trade costs are sufficiently high but relaxes it when trade costs are low. Thus, if we ignore the possibility of FDI regulation, the "race to the bottom" story occurs when trade costs are sufficiently low.

In the presence of FDI regulation, the analysis is somewhat complex due to two equilibrium fiscal policies. Recall that the equilibrium fiscal policy is $\min\{\widehat{t}_A^{JV}, \widehat{t}_A^{L}\}$ with FDI regulation. By differentiating $\widehat{t}_A^{JV}$ and $\widehat{t}_A^{L}$, we have

$$\begin{aligned}
\frac{\partial \widehat{t}_A^{L}}{\partial \tau} &= -\frac{\{9(1-\tau)(1-\alpha) + 4n(1-2c+\tau)\}}{18(1-\alpha)} < 0 \\
\frac{\partial \widehat{t}_A^{JV}}{\partial \tau} &= \frac{\{16n(1+c-2\tau) - 9(1-\tau)(1+2\alpha)\}}{36\alpha} \gtreqless 0 \\
&\Leftrightarrow n \gtreqless \frac{9(1-\tau)(1+2\alpha)}{16(1+c-2\tau)} \Leftrightarrow \tau \lesseqgtr \frac{16n(1+c) - 9(1+2\alpha)}{32n - 9(1+2\alpha)}.
\end{aligned}$$

Thus, a reduction in τ always enhances $\widehat{t}_A^{L}$; however it can increase $\widehat{t}_A^{JV}$ only when the population gap is small or the transportation cost is large.

The equilibrium fiscal policy in country A is drawn in Fig.3 at different levels of the population gap in the (τ, t_A) plane.[18] The thick curves represent the case with a wider population gap ($n = 2$) whereas the thin ones correspond to the case with a narrow gap ($n = 1.7$). Given a fixed level of α, we can derive unique thresholds, τ^{α^t} and τ^{α^J}, such that $\widehat{t}_A^{JV}(\underline{t}_B) = \widehat{t}_A^{L}$ and $\widehat{t}_A^{L} = \underline{t}_A^{JV}$ hold. Both curves are kinked at τ^{α^t} and the optimal fiscal policy is $\widehat{t}_A^{JV}$ ($\widehat{t}_A^{L}$) when $\tau < \tau^{\alpha^t}$ ($\tau^{\alpha^t} < \tau$) holds. In the range

[16] When country B hosts firm M, we can easily confirm that $t_B^{JV*} = t_B^{FDI*} + \frac{(5-22c)(1-2c)}{72}$. This means that changes in the equilibrium fiscal policies are always the same between the two cases. Moreover, we can derive $\frac{\partial t_B^{FDI*}}{\partial \tau} = \frac{\partial t_B^{FDI*}}{\partial \tau} = \frac{(22n-9)\tau - (14cn+8n-9)}{18} \gtreqless 0 \iff \tau \gtreqless \frac{14cn+8n-9}{22n-9}$.

[17] We can confirm that $\tau^{max} - \frac{16n(1+c)-27}{32n-27} = \frac{27(1-c)}{2(32n-27)} > 0$ holds.

[18] We use the following parameters: $c = 0.3$ and $\alpha = 0.7$.

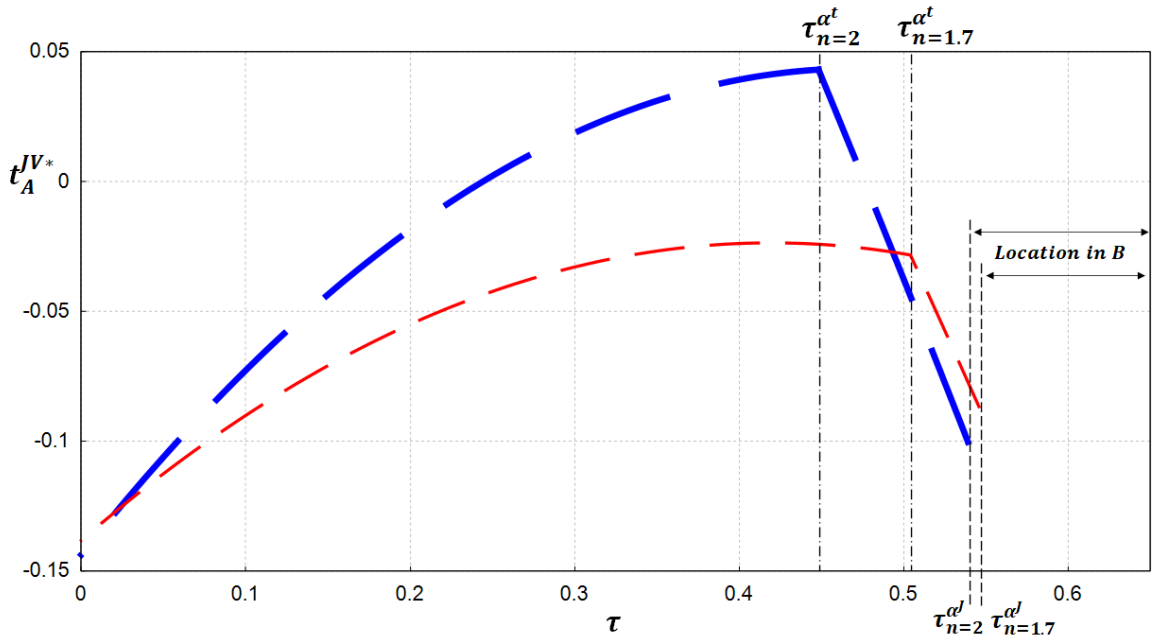

Figure 3: Fiscal policy in A over τ

$\tau \in [0, \tau^{\alpha^t})$, the thick curve shows that the effect of a reduction in τ on $\widehat{t}_A^{JV}$ is monotonic in the case with a larger population gap; however, with a narrow population gap, a hump-shaped relationship between transportation costs and fiscal policy is observed, as depicted by the thin curve. Under a large $\tau(> \tau^{\alpha^t})$, a monotonic and negative relationship between τ and t_A^{JV*} is shown. Therefore, trade liberalization mitigates the fiscal competition if transportation costs are high, which is a similar pattern to that in the case without FDI regulation.

In addition, Fig.4 shows welfare in country A in equilibrium.[19] The left figure depicts welfare with $c = 0.2 \left(< \frac{5}{22}\right)$ while the right one uses $c = 0.3 \left(> \frac{5}{22}\right)$. In each figure, the dashed curve represents the case with FDI regulation, whereas the solid curves show that without FDI regulation. In the ranges of $\tau \in [0, \tau^{\alpha^B}_{c=0.2}]$ and $\tau \in [\tau_c^{\alpha^J}, \tau_c^{max}]$, country A cannot attract the MNE and $W_A^B (< W_A^A(t_A^{FDI*}))$ holds. At $\tau \in [\max\{\tau_c^B, 0\}, \tau^{\alpha^J}]$, the MNE locates in country A in equilibrium.

As shown in proposition 2, welfare in country A without FDI regulation is always higher when country A is the host country in the left figure $\left(c < \frac{5}{22}\right)$. However, in the right figure, welfare in country A with FDI regulation is greater when $\tau \in [0, \tau^{\alpha^t})$ holds. Thus, when τ is sufficiently small, trade liberalization decreases welfare in country A but such a welfare loss is mitigated if the technological gap is large.

[19]The figures use $n = 2$ and $\alpha = 0.7$ and different sets of c. The left figure uses $c = 0.2$ whereas the right one uses $c = 0.3$.

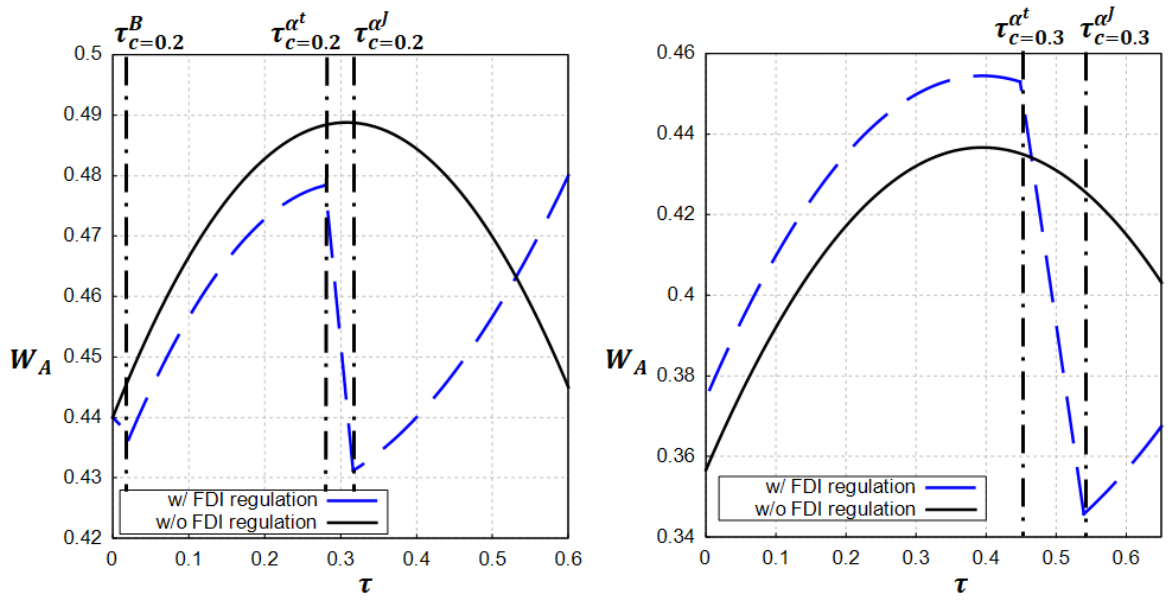

Figure 4: Welfare in A over τ

5.2 Substitutability of goods

In this paper, we assumed that both firms produced homogeneous goods, which most clearly shows the mechanism behind the results. Here, we briefly argue for the importance of the assumption by considering the case with a firm in an independent industry.

Suppose that there are two independent industries, X and Z, and firm M operates in industry X, whereas firm L operates in industry Z. In this case, firm M's entry into country A has no impacts on industry Z and therefore we can simply ignore the outcomes in the industry. This means that firm L always accepts a JV offer because of additional profits from industry X, that is, $(1-\alpha)\pi^{JV}$, and the equilibrium in the benchmark analysis in which firm M enters country B under $\alpha \in (\alpha^J, 1)$ no longer exists. Moreover, consistent with Haufler and Wooton (1999), we can confirm that firm M's location in equilibrium under fiscal competition is in country A. The reason is that government A has stronger gains from attracting firm M via consumer surplus and the local firm's additional profits and can provide sufficiently large subsidies to cover firm M's losses via forming a JV with the local firm.[20] The above discussion indicates that our results in the main analysis require a sufficiently strong similarity of goods, which creates firm L's incentive to decline a JV offer and the government's weaker willingness to attract firm M under FDI regulation due to an increase in market power.

[20]Specifically, the most generous fiscal policy in country A is $\underline{t}_A = -\frac{CS^A_A - CS^B_A + (1-\alpha)\pi^A_M}{\alpha}$, where π^A_M represents firm M's operating profits when it establishes its subsidiary in A, whereas that in country B is the same as in the benchmark analysis. Then, we have $\Pi_M(\underline{t}_A) - \Pi^B_M(\underline{t}_B) = \frac{3(n-1)(2-\tau)\tau}{8} > 0$.

6 Conclusion

With globalization, harmful tax/subsidy competition has been among the central policy discussions in the context of international taxation. In parallel, we also have observed a relaxation of FDI regulation such as the mitigation of foreign-ownership restrictions; however, the interrelation between the two policies has been overlooked in the literature. To explore the interlink, this paper extended Bjorvatn and Eckel (2006) by introducing foreign-ownership regulation.

Among the main findings in the paper is that FDI regulation influences the equilibrium location choice of an MNE headquartered in a third country outside the region with two competing countries. In the absence of FDI regulation, as is well known in the literature, the larger country with a local firm is likely to be the host country for an MNE headquartered in a third country outside the region. The smaller country can host the MNE only when the gap between the market sizes of the larger and smaller countries is narrow as monopoly profits in the smaller country are relatively more important than a duopoly market in the larger country.

In the presence of FDI regulation, however, the *smaller* country can win the competition for the MNE irrespective of the market-size gap. This outcome is realized when (i) the technological gap between the MNE and the local firm is narrow and transportation costs between the competing countries are low, or (ii) the foreign-ownership regulation is *loose*. In the first case, the larger country's government has less of an incentive to attract the MNE because the FDI regulation induces the MNE and local firm to establish a JV and thus a monopoly output level of supplies is realized. With a smaller technological gap, large amounts of goods are supplied even if the MNE locates in the smaller country due to the local firm's supplies, and thus the larger country's most generous fiscal policy is not as attractive.

Second and more interestingly, the smaller country can host the MNE when the larger country's FDI regulation is loose. This is because the local firm declines the JV offer by the MNE because the local firm's profits based on the equity ratio are small. At a glance, looser FDI regulation enhances the MNE's position in the JV and it is expected that looser regulation makes it more likely that the MNE's equilibrium location is in the larger country. However, this ignores the local partner firm's viewpoint, and our result shows that looser regulation decreases the local firm's gains from the JV, leading to the result that the smaller country attracts the MNE.

We also investigated the welfare effect of FDI regulation assuming the MNE's location was fixed. On the one hand, when the larger country is the host, FDI regulation is beneficial if the technological gap is wide. This is because the local firm's production is less efficient and the local

firm can increase its profits from a JV in the case of FDI regulation. On the other hand, when the smaller country is the host, FDI regulation is beneficial if the technological gap is narrow. In such a case, the incentive of the larger country'sgovernment to attract the MNE is weaker because the establishment of a JV increases its market power and hurts consumers. Such a disincentive mitigates the fiscal competition and thus welfare in the smaller country increases.

Despite the new findings obtained, there remains room for further research. In the current model, we assumed away other motivations for governments to attract the MNE than more supplies due to the absence of transportation costs. However, governments in developing countries expect job-creation effects and/or technological spillovers in reality. Thus, it would be interesting to introduce unemployment and research and development activities into the model. Furthermore, the current model ignores the possibility of forming a JV without FDI regulation to focus on a comparison between traditional models without FDI regulation and the model with FDI regulation. Thus, considering a JV without FDI regulation could also be considered in future studies. Finally, as FDI regulation varies across industries in reality, an empirical investigation about the link between inward FDI and FDI regulation is essential.[21] We leave these directions for extensions for future research.

Appendixes

A. Derivation of $\min\left\{\widehat{t}_A^{JV}, \widehat{t}_A^{L}\right\} \geq \underline{t}_A^{JV}$ under $0 < \alpha < \alpha^J$

Recall that $\widehat{t}_A^{JV} < \widehat{t}_A^{L}$ holds when $0 < \alpha < \alpha^t$ holds and $\widehat{t}_A^{JV} > \widehat{t}_A^{L}$ holds when $\alpha^t < \alpha$ holds.

First, suppose that $0 < \alpha < \alpha^t$ holds. We can compute

$$\widehat{t}_A^{JV}(\underline{t}_B) - \underline{t}_A^{JV} = \frac{n\xi - 27(2-\tau)\tau}{72\alpha}.$$

As this condition is equivalent to the condition $\Pi_A^{JV}(\underline{t}_A^{JV}, \underline{t}_B) \gtreqless \Pi_B(\underline{t}_B)$, whenever country A can attract firm M, $\widehat{t}_A^{JV}(\underline{t}_B) > \underline{t}_A^{JV}$ holds.

[21] See `https://stats.oecd.org/Index.aspx?datasetcode=FDIINDEX` for the variation of the FDI index across industries.

Next, consider the case of $\alpha^t < \alpha < 1$. Then, we have

$$\widehat{t}_A^L - \underline{t}_A^{JV} = \frac{\Xi}{72\alpha(1-\alpha)}$$
$$\text{where } \Xi \equiv 3n(1+16c-12c^2+8c\tau-4\tau^2)+18(1-\tau)^2$$
$$-\alpha\left[n\{11+16c-4c^2+8(2-c)\tau-4\tau^2\}+18(1-\tau)^2\right]$$

Hence, $\widehat{t}_A^L > \underline{t}_A^{JV} \Leftrightarrow \Xi > 0 \Leftrightarrow \alpha < \alpha^J \equiv \frac{3n(1+16c-12c^2+8c\tau-4\tau^2)+18(1-\tau)^2}{n\{11+16c-4c^2+8(2-c)\tau-4\tau^2\}+18(1-\tau)^2}$ holds.

Therefore, in the range of $0 < \alpha < \alpha^J$, $\min\left\{\widehat{t}_A^{JV}, \widehat{t}_A^L\right\} \geq \underline{t}_A^{JV}$ holds.

B. Derivation of n^{JV}

We derive n^{JV}, which is defined by $\Pi_M^{JV} = \Pi_M^B(\underline{t}_B)$. We can calculate the difference,

$$\Pi_M^{JV}(\underline{t}_A^{JV}) - \Pi_M^B(\underline{t}_B) = \frac{n\xi - 27(2-\tau)\tau}{72}$$
$$\text{where } \xi \equiv -5+32c-44c^2+32\tau+56c\tau-44\tau^2.$$

As $\xi < 0$ holds when $\tau < \tau^B$ holds, $\Pi_M^{JV}(\underline{t}_A^{JV}) - \Pi_M^B(\underline{t}_B) < 0$ holds and country A always loses the fiscal competition in such a case.

In contrast, when $\tau^B < \tau$ holds, ξ is positive and $\Pi_M^{JV}(\underline{t}_A^{JV}) \gtreqless \Pi_M^B(\underline{t}_B)$ holds if and only if $n \gtreqless \frac{27(2-\tau)\tau}{\xi} = n^{JV}$.

C. Proof of lemma 3

Suppose, first, the case in which $0 < \alpha < \alpha^t$ holds and $t_A^{JV*} = \widehat{t}_A^{JV}(\underline{t}_B)$. By substituting $\widehat{t}_A^{JV}(\underline{t}_B)$ into eq.(10), we have

$$W_A^{JV}\Big|_{t_A=\widehat{t}_A^{JV}(\underline{t}_B)} = \frac{n}{8} + \frac{n+(1-\tau)^2}{4} - \frac{n(1+16c-12c^2+8c\tau-4\tau^2)+6(1-\tau)^2}{24} + nI,$$

which is independent from α and thus $\frac{\partial W_A^{JV}\big|_{t_A=\widehat{t}_A^{JV}(\underline{t}_B)}}{\partial\alpha} = 0$ holds.

Next, under the range of $\alpha \in (\alpha^t, \alpha^J)$, the equilibrium fiscal policy is $t_A^{JV*} = \widehat{t}_A^L$. Similarly, by using $t_A = \widehat{t}_A^L$,

$$W_A^{JV}\Big|_{t_A=\widehat{t}_A^L} = \frac{n}{8} + \frac{n+(1-\tau)^2}{4} - \left(\frac{\alpha}{1-\alpha}\right)\left(\frac{n(1-2c+\tau)^2}{9}\right) + nI$$

is obtained. Taking the first derivative of the above equation yields $\frac{\partial W_A^{JV}\big|_{t_A=\widehat{t}_A^L}}{\partial \alpha} = -\frac{n(1-2c+\tau)^2}{9(1-\alpha)^2} < 0$.

Finally, we can compute

$$\begin{aligned} W_A^{JV}\Big|_{t_A=\widehat{t}_A^L} - W_A^{JV}\Big|_{t_A=\widehat{t}_A^{JV}} &= -\left(\frac{\alpha}{1-\alpha}\right)\left(\frac{n(1-2c+\tau)^2}{9}\right) \\ &\quad + \frac{n(1+16c-12c^2+8c\tau-4\tau^2)+6(1-\tau)^2}{24} \\ &= \alpha\left(\frac{n+(1-\tau)^2}{4} - \left(\frac{n(1-2c+\tau)^2}{9(1-\alpha)}\right)\right) \\ &\quad - \left(\frac{n+(1-\tau)^2}{4} - \frac{n(1+16c-12c^2+8c\tau-4\tau^2)+6(1-\tau)^2}{24\alpha}\right) \\ &= \alpha\left(\widehat{t}_A^L - \widehat{t}_A^{JV}\right), \end{aligned}$$

and $\widehat{t}_A^L = \widehat{t}_A^{JV}$ holds at $\alpha = \alpha^t$, by definition. Thus, at $\alpha = \alpha^t$, $W_A^{JV}\Big|_{t_A=\widehat{t}_A^L} = W_A^{JV}\Big|_{t_A=\widehat{t}_A^{JV}}$ also holds.

D. Derivation of the signs of $\frac{\partial n^{JV}}{\partial \tau} = \frac{54\{28(1-c)\tau^2+(1-2c)(5-22c)\tau-(1-2c)(5-22c)\}}{\xi^2}$

By differentiating n^{JV} with respect to τ, we have $\frac{\partial n^{JV}}{\partial \tau} = \frac{54\xi_{n^{JV}}}{\xi^2}$, where $\xi_{n^{JV}} \equiv 28(1-c)\tau^2 + (1-2c)(5-22c)\tau - (1-2c)(5-22c)$, and hence $\xi_{n^{JV}}$ determines the sign of $\frac{\partial n^{JV}}{\partial \tau}$.

First, suppose $c > \frac{5}{22}$ holds. Note that $\xi_{n^{JV}}$ takes the minimum value when $\tau = \frac{-(1-2c)(5-22c)}{56(1-c)}$ holds, and the minimum value is given by

$$(\xi_{n^{JV}} \geq)\ \xi_{n^{JV}}\big|_{\tau=\frac{-(1-2c)(5-22c)}{56(1-c)}} = -\frac{(1-2c)(5-22c)(3-2c)(39-22c)}{112(1-c)}.$$

Hence, $c > \frac{5}{22}$ yields $\xi_{n^{JV}}\big|_{\tau=\frac{-(1-2c)(5-22c)}{56(1-c)}} > 0$, and thus consequently $\xi_{n^{JV}} > 0$ holds.

Next, suppose $c < \frac{5}{22}$. As the minimum value is negative and $\xi_{n^{JV}}$ is a convex function, there exist a unique threshold such that $\xi_{n^{JV}} =\geq 0$ holds in the range of $\tau > 0$. Specifically,

$$\xi_{n^{JV}} \geq 0 \iff \tau > \frac{-(1-2c)(5-22c)+\sqrt{(1-2c)(5-22c)(3-2c)(39-22c)}}{56(1-c)} (> \tau^B)$$

is obtained. Hence, $\frac{\partial n^{JV}}{\partial \tau} > 0$ holds if $\tau > \frac{-(1-2c)(5-22c)+\sqrt{(1-2c)(5-22c)(3-2c)(39-22c)}}{56(1-c)}$ holds, whereas $\frac{\partial n^{JV}}{\partial \tau} < 0$ holds if $\tau^B < \tau < \frac{-(1-2c)(5-22c)+\sqrt{(1-2c)(5-22c)(3-2c)(39-22c)}}{56(1-c)}$.

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