Optimal Regulation of Multinationals under Collusion∗

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Abstract

This paper analyzes the optimal collusion-proof mechanism for the regulation of multinational firms (MNFs) in foreign direct investment (FDI) projects. There is a host country with a profitable investment opportunity. Either a multinational firm (MNF) or a local firm (LF) can undertake this project nonetheless due to its firm-specific advantage, the MNF has the potential to create a larger surplus. The host government faces an informational constraint such that it cannot observe the extra surplus the MNF can generate. Using this setup, Karabay (2010) shows that employing foreign ownership restrictions to force a joint venture (JV) can help the host government to partially overcome its information disadvantage. In this paper, we extend Karabay (2010) by studying the host government’s optimal regulatory policy when the MNF and the LF can collude. It turns out collusion imposes no cost on the host government and the expected welfare attained in the absence of collusion can still be secured under collusion.

Keywords: Foreign Ownership; FDI; Multinationals; Regulation; Collusion; Asymmetric Information, Mechanism Design.

JEL classification: F23; L24; L5; D82.

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1. Introduction

Since the second half of the twentieth century, globalization has gained momentum. Without doubt, one of the leading indicators of this expanded economic activity has been the steady rise in foreign direct investment (FDI) flows. While in 1970, world FDI inflows were only $13.4 billion, they reached a record high value of $2 trillion in 2007.\(^1\) Lately, this upward trend has interrupted with the advent of the 2008-2009 global financial crisis.\(^2\) Nevertheless, this interruption turns out to be short-lived (UNCTAD, 2013) and FDI flows still continue to play a key role in facilitating international integration by making strong economic links between nations.

Despite the well-known benefits of FDI flows,\(^3\) strict regulatory restrictions by host governments are fairly common.\(^4\) This is especially true for Asian countries such as Indonesia, Thailand, China, Malaysia, the Philippines, etc. These countries manage to attract large amounts of FDI flows,\(^5\) while following policy regimes that are not in the interest of multinationals. To regulate multinationals, they make use of various restrictive measures including performance requirements, sectoral prohibitions, screening and equity restrictions (see Walter, 1999). Among them, the most visible restriction is the foreign ownership restriction.\(^6\) For example, according to 1996 report by the Productivity Commission of Australia, ownership restrictions and joint venture requirements are the primary hurdles faced in Asian countries.

A distinctive feature of FDI relative to other sorts of investments is the control over operations. Ownership is the purchase of residual rights of control. As shown by Grossman and Hart (1986), Hart and Moore (1990) and Hart (1995), wrong allocation of residual rights can have harmful con-

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\(^1\)These values are obtained from [http://unctadstat.unctad.org/wds/](http://unctadstat.unctad.org/wds/).

\(^2\)According to UNCTAD (2012), FDI flows in 2011 were 23\% below their 2007 peak.

\(^3\)Some concerns are mentioned about the negative economic and political effects of FDI as well such as balance of payments deficits, reduced domestic research and development, diminished competition, crowding-out of domestic firms and lower employment. However, these claims are not well supported in the data (see, for example, Graham and Krugman, 1995).

\(^4\)FDI restrictions differ by sector. For example, services is far more restrictive than manufacturing. Moreover, sectors like telecoms, transport, electricity and finance are significantly restricted (see Golub, 2003).

\(^5\)There has been considerable change in the distribution of investments across regions. While the share of FDI flowing into Asia has surged, the Europe and North America experienced a decline in their share. (See Productivity Commission Report of Australia, 2010.)

\(^6\)The limits on foreign equity are usually specified on an industry-by-industry basis and generally concentrated on in some sectors like transport, telecommunications, finance and electricity (see Golub, 2003).

\(^7\)In fact, over the years many countries (both developing and developed) have employed some kind of indigenisation policy. Indigenisation is defined by Katrak (1983) as the requirement that the host country imposes on an investor to share ownership of an affiliate with residents in the host country. Many countries have a policy that allows FDI only through ventures with local firms (Golub, 2003; OECD, 2007). Imposing a joint venture is similar to ownership restrictions in that they require the MNF to offer a minimum profit share to the domestic partner.
sequences by distorting agents’ incentives in unintended ways. In other words, forcefully changing
the ownership structure might create inefficiencies which can decrease the profitability of the firm.
In that case, it is puzzling to witness such a prevalent adoption of foreign equity restrictions by host
governments in lieu of alternative policy instruments. Karabay (2010) explores this issue and con-
cludes that under asymmetric information, utilizing foreign ownership restrictions to force a joint
venture enhances the monitoring capacity of host governments. The idea is that multinationals
engage in many activities to obfuscate cash flows for tax evasion and JV partners can do a better
job in keeping track of cash flows than host governments due to their control rights.

In real life, firms often perform tax sheltering activities. For example, under U.S. law, firms are
allowed to keep two sets of books – a bullish book income report released publicly to shareholders
and a lowball tax income report provided to the IRS. In the late 1990’s, the gap between book
and tax income was widening.\footnote{See the documentary by Frontline at http://www.pbs.org/wgbh/pages/frontline/shows/tax/.}
The income to shareholders went up rapidly. The taxable income reported to the IRS stayed the same, and in some years, actually declined. Even though IRS
gradually discovers how these schemes work, corporations always come up with new schemes. They
use various financial mechanisms to create losses in their financial statements in order to avoid
taxation. On the other hand, joint venture partners can do better monitoring than outsiders due
to ownership control rights. They are active monitors in companies. Monitoring is enhanced due
to the increased disclosure requirement among JV partners. For example, they have administrative
controls such as appointing board of directors in proportion to equity holdings. This provides a
direct communication link with senior management of the parent companies, facilitating superior
monitoring of partner firms’ activities (Kogut, 1988).

To formalize this idea, a stylized model of FDI is developed in Karabay (2010). There is a
host market which can support a monopolist to take advantage of an investment opportunity.
Although either an MNF or a local firm (among a pool of competitive local firms) can undertake
this opportunity, the MNF can generate a larger surplus due to its intangible assets.\footnote{These intangible assets are firm specific and include brand name, experience, scientific know-how, patents, etc. Their dissipation risk is one reason why FDI is more like to occur compared to licensing (Navarette and Venables, 2004, p. 114).} As a result,
\textit{ceteris paribus}, it is more efficient for the MNF to undertake this project. The extra surplus is

\footnote{This productive difference of multinationals is also supported by other studies as well (see Blomström and Wolff, 1994; Doms and Jensen, 1998; Globerman \textit{et al}., 1994; Haddad and Harrison, 1993; Helpman \textit{et al}., 2004; Kokko \textit{et al}., 2001 and Sjöholm, 1999). Furthermore, in general the productivity is increasingly firm specific (Cerny, 1995).}
based on the MNF’s firm specific advantage and to reap its benefits, the MNF needs to incur costly unobservable effort. The host government’s welfare is made up of the weighted average of its tax revenue and any local firm’s profit. The host government faces an information disadvantage such that it cannot observe the extra surplus that the MNF can generate over the LF. However, in case of a joint venture with a local firm, it is assumed that the local JV partner can monitor cash flows due to its ownership control rights. Using this setup, Karabay (2010) shows that the watchdog role played by the local JV partner can in fact help the host government to mitigate its information disadvantage.

In the above setting, the host government, as the principal, managing two agents, namely the MNF and the local JV partner. In general, any contract with multiple agents is prone to collusive behavior. This is what we explore in this paper. To do so, we extend the model developed in Karabay (2010) by allowing collusion between JV partners. In line with the earlier literature, we model collusion as a side contract between them. As analyzed in Karabay (2010), in the absence of collusion, incentive compatibility and individual rationality constraints lay out the outcomes available for the host government. When the agents have the capacity to collude on how they respond to the contract, this affects the contract design problem and restricts the principal. This is indeed true since the original mechanism proposed in Karabay (2010) is no longer viable given the JV partners’ incentives to collectively mislead the host government, and thus a new mechanism that is collusion-proof needs to be devised. The grand contract offered by the host government should be such that there will be no scope for collusion between JV partners. We show that in the collusion-proof grand contract: (i) foreign equity restrictions are continued to be utilized; (ii) the expected welfare obtained in the second-best contract is still attainable. Thus, collusion does not cause any loss for the host government.

Related Work. There has been a vast literature analyzing collusion under asymmetric information. Laffont and Martimort (1997, 2000) develop a general methodology that includes collusion as part of the grand mechanism. Laffont and Martimort (1997) and Quesada (2004) show that when agent types are uncorrelated, optimal outcome can be constructed so that it is collusion proof at no cost. In contrast, as shown by Laffont and Martimort (2000), when types are correlated, this result does not hold anymore and there are costs on the principal to rule out collusion. Che and Kim (2006) consider a very general model under collusion and show that any payoff the principal can achieve in a collusion-free setup can also be achieved in the presence of collusion. Their idea is
based on selling the firm to the coalition of agents, which entails an ex post payment collection that is independent of the state. Celik (2008) examines a game with a budget-constrained risk-averse principal. In his setup, a risk-neutral insurer can help the principal to smooth against variations in the payment to the agent. He identifies the optimal implementable outcome under collusion. Celik (2009) analyzes collusion under partially informed third-party supervision and shows that directly contracting with the agent and the supervisor improves the principal’s payoff relative to no-supervision. Burlando and Motta (2014) analyze the optimal organization response to internal collusion and show that collusion imposes no cost on the principal.

Our model is an application of mechanism design under collusion. Therefore, our focus is different than the previous literature although our approach in finding the optimal mechanism has some similarities to the above mentioned papers, especially to Che and Kim (2006). In Che and Kim (2006), each agent knows its own type but not others’ before participating to the grand contract. Since production is a joint effort, they do not know the outcome before deciding on the participation. Therefore, their participation constraints need to be satisfied ex ante, i.e., in expectation. In our model, the MNF is the only party with the private information and it learns its type before the grand contract offer. In contrast, the local JV partner does not know the MNF’s private information when the grand contract is offered. Given this structure, the LF’s participation constraint needs to be satisfied ex ante (as in Che and Kim, 2006) whereas the MNF’s participation constraint needs to be satisfied ex post (different than Che and Kim, 2006). As a result, it is not possible to charge a fixed fee to the JV, however, it is possible to make the local JV partner as the residual claimant. Indeed, charging a fixed fee net of a type-dependent transfer can guarantee the host government an expected welfare that is identical to the one obtained in the absence of collusion.

Furthermore, there are also papers that analyze the optimal regulation of multinationals in alternative setups in which neither foreign equity restrictions nor collusion are considered: Prusa (1990), Gresik and Nelson (1994), Bond and Gresik (1996), Calzolari (2001) and Konrad and Lommerud (2001).

The rest of the paper is organized as follows. In the next section, we describe the basic model framework. In section 3, we examine the optimal regulatory mechanism under collusion. Section 4 concludes the analysis.
2. Model

In this section, we describe the main features of our model. The setup is based on Karabay (2010). That paper analyzes the optimal host country policy when there is no collusion between the MNF and the LF. Here, we consider an alternative environment in which the MNF and the LF collude and examine how the optimal regulatory mechanism changes. We start by reviewing the main model characteristics.

Consider a host country with an advantage for the production of a particular good. Either an MNF or a local firm (among a pool of identical competitive local firms) can undertake this project yet the revenue generated is larger if the MNF carries it out. This is true since the MNF has firm-specific advantage over local firms. The MNF’s revenue has two components: an observable part, denoted by \( \pi \geq 0 \) and an unobservable part. The observable part is assumed to depend on output, so no information asymmetry is present for that part. On the other hand, the unobservable part is associated with the MNF’s firm-specific advantage such as brand name effect, experience, etc., and therefore it is independent of output. From now on, we will refer to this unobservable part as the MNF’s extra surplus. In contrast, if a local firm takes on this project, the total revenue is equal to \( \pi \), which is identical to the observable portion of the revenue the MNF can generate. It is assumed that the MNF always prefers to enter the host market as a wholly-owned firm.\(^{11}\)

Furthermore, in a possible JV, local firms do not have any bargaining power and play no role in determining ownership shares.\(^{12}\)

The MNF’s extra surplus is made up of two parts: the MNF’s firm-specific advantage, \( b \), and the MNF’s effort, \( e \). In other words, to benefit from its firm-specific advantage, the MNF needs to incur a costly unobservable effort. We assume a specific functional form for this extra surplus: \( e \star b \), where \( b \) is assumed to be a random variable with support \([\underline{b}, \overline{b}]\), \( 0 \leq \underline{b} < \overline{b} \), distribution function \( F(b) \), density function \( f(b) \) and the effort cost is equal to \( \frac{\varepsilon^2}{2} \), where \( \varepsilon \in \{0\} \cup R^+ \). We also assume that \( \frac{1-F(b)}{f(b)} \) is decreasing in \( b \).\(^{13}\) Only the MNF knows the actual value of its firm-specific advantage.

\(^{11}\)The underlying assumption here is that having a local JV partner does not increase the total surplus. Alternatively, one may assume that a possible JV can create more surplus. This could be conveniently incorporated into the model by increasing the publicly observable portion of the surplus such that \( \pi^{JV} > \pi \) and all the results would still hold.

\(^{12}\)It follows directly from an assumption that local partners are drawn from a supply of homogeneous and competitive firms.

\(^{13}\)This is the standard monotone hazard rate condition. Examples of distributions that satisfy this condition include the uniform, the exponential, the normal, the extreme value, the logistic and the Laplace distributions. A
advantage, \( b \). The host government can observe neither \( e \) nor \( b \). Moreover, it cannot observe the resulting extra surplus, \( e \ast b \). In case of a JV, however, the local JV partner can identify the realized surplus \( e \ast b \), but not the individual values of \( e \) or \( b \).

The host government’s welfare is made up of the weighted average of its tax revenue and the local firm’s profit. It is assumed that resulting product is sold to a third market, hence no consumer effects. The host government can utilize lump-sum tax/subsidy and/or domestic ownership requirement to regulate the MNF.\(^{14}\) We assume that if there exists a joint venture, then it is possible for the host government to tax JV partners separately once the profit shares are distributed.\(^{15}\) Additionally, if the host government decides to use ownership requirements, the local JV partner is selected arbitrarily by the host government.\(^{16}\)

Once the surplus is realized, it is assumed that the local firm can costlessly claim its government-determined share by appealing to court.\(^{17,18}\) We also assume that each agent in this model is risk-neutral.

Karabay (2010) analyze the model where it is \textit{not possible} for the JV partners to form a sustainable collusion.\(^{19}\) Under this assumption, timing of the game is given as follows:

1. The MNF learns the actual value of the firm-specific advantage \( b \).

2. The host government designs a mechanism that states a lump-sum tax/subsidy and ownership share for the MNF and the LF given the report of \( b \) by the MNF.

3. The MNF and the LF decide whether to accept this mechanism or not. If they both accept the game continues. Otherwise, the game ends here.\(^{20}\)

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\(^{14}\) Focusing on linear incentive contracts are justified by their robustness to uncertainty (Laffont and Tirole, 1986).

\(^{15}\) The taxation of joint ventures is a delicate issue and different countries can follow different rules. However, in general, if the firm is considered as a contractual joint venture, then each partner pays his/her own income tax, whereas, if it is considered as a corporate joint venture, the firm as a whole pays income tax to the government. In this paper, we have a contractual joint venture in mind. Karabay \textit{et al.} (2009) consider a corporate joint venture as an alternative.

\(^{16}\) One can analyze the game between local firms and the host government for the selection of the JV partner. However, it is beyond the scope of this paper.

\(^{17}\) Introducing a small cost for appealing to court would not change any of the results other than shifting rents from the host government to the MNF in the amount of this cost.

\(^{18}\) The local JV partner can obtain hard evidence about cash flows and this can be verifiable in court. This assumption is commonly used in the literature (Baron and Besanko, 1984; Chu and Qian, 1995).

\(^{19}\) A sustainable collusion is possible if the local JV partner can guarantee not to appeal to court to receive its government-determined share once the project is completed.

\(^{20}\) Alternatively, we can assume that the host government continues to play the game with the MNF even if the LF
4. The MNF announces its \( b \) to the host government and the MNF’s and the LF’s ownership share and tax/subsidy are determined by the mechanism stated in step 2.

5. The MNF chooses its effort level.

6. Production occurs and respective payoffs are realized.

Without loss of generality, Karabay (2010) restricts attention to truthful revelation mechanism.\(^{21}\) In the context of the model, an optimal mechanism can be represented by the following five-tuple:

\[
M1 \equiv \{ \alpha (b) , T_1^{LF} (b) , T_2^{LF} (b) , T^{MNF} (b) , \gamma (b) \} ,
\]

where \( \alpha (b) \in [0,1] \) is the probability that the host government allows the MNF take part in the production process, \( T_1^{LF} (b) \) is the payment to be made to the government by the local firm as a function of the report of \( b \) when the MNF is not allowed to operate in the host market, \( T_2^{LF} (b) \) and \( T^{MNF} (b) \) are, respectively, the payments to be made to the government by the local firm and the MNF as a function of the report of \( b \) when the MNF is allowed to operate in the host market, \( \gamma (b) \in [0,1] \) represents the maximum ownership the MNF can have if it is allowed to operate in the host market.

Moreover, denote \( p(\gamma (b)) \) be the probability that the local firm observes the extra surplus created by the MNF, where \( p(\gamma (b)) \in [0,1], \frac{dp(\gamma (b))}{\gamma (b)} \leq 0 \) and \( p(0) = 1 \). Notice that this probability is non-increasing in the MNF’s ownership share (hence, non-decreasing in the local firm’s ownership share).\(^{22}\)

Given a mechanism, \( M1 \), denote by \( \Pi^{MNF}(\hat{b}|b) \) the profit made by the MNF of type \( b \) if it reports type \( \hat{b} \). Clearly,

\(^{21}\)For truthful revelation, see Dasgupta et al. (1979), Myerson (1981) and Baron and Myerson (1982). It is possible to replicate this direct mechanism with an equivalent indirect mechanism in which the MNF does not announce its type but rather chooses its ownership share and corresponding tax payment from a menu consisting of ownership share-tax payment pairs. See Fudenberg and Tirole (1991), pp. 257-258.

\(^{22}\)This assumption allows for the possibility that the local JV partner might have better monitoring abilities with higher ownership shares.
\( \Pi^{MNF}(\hat{b}|b) = \begin{cases} p(\gamma(\hat{b}))\alpha(\hat{b}) [\gamma(\hat{b})|\pi + eb] - T^{MNF}(\hat{b}) - \frac{\epsilon^2}{2} + (1 - p(\gamma(\hat{b}))) \alpha(\hat{b}) [\gamma(\hat{b})|\pi + eb] - T^{MNF}(\hat{b}) - \frac{\epsilon^2}{2}, \end{cases} \)

which can be rewritten as

\[
\Pi^{MNF}(\hat{b}|b) = \alpha(\hat{b}) \left[ \gamma(\hat{b})|\pi + \left[1 - p(\gamma(\hat{b})) \left(1 - \gamma(\hat{b})\right)\right] eb - \frac{\epsilon^2}{2} - T^{MNF}(\hat{b}) \right].
\] (1)

In the above profit function, the cost of the MNF’s effort cannot be observed by others. Therefore, the only incentive for the MNF to incur effort is its ownership shares, i.e., the effort level the MNF incurs depends on its stake in the project. The optimal effort level by the MNF given the ownership shares can be found by maximizing equation (1) with respect to \( \epsilon \):

\[
\epsilon = \left[1 - p(\gamma(\hat{b})) \left(1 - \gamma(\hat{b})\right)\right] b.
\]

Plugging the value of \( \epsilon \) into equation (1), we obtain:

\[
\Pi^{MNF}(\hat{b}|b) = \alpha(\hat{b}) \left[ \gamma(\hat{b})|\pi + \left[1 - p(\gamma(\hat{b})) \left(1 - \gamma(\hat{b})\right)\right] b^2 - T^{MNF}(\hat{b}) \right].
\] (2)

The requirement of truthful reporting (incentive compatibility) gives us \( \Pi^{MNF}(b|b) \geq \Pi^{MNF}(\hat{b}|b) \) for all \( b, \hat{b} \in [\underline{b}, \overline{b}] \). Likewise, \( \Pi^{MNF}(b|b) \geq 0 \) for all \( b \) by imposing the condition of individual rationality.

Similarly, the local firm’s profit can be written as follows\(^{23}\)

\[
\Pi^{LF}(b) = \begin{cases} (1 - \alpha(b)) \left[\pi - T_{1}^{LF}(b)\right] + (1 - p(\gamma(b))) \alpha(b) \left(1 - \gamma(b)\right) \left[\pi - T_{2}^{LF}(b)\right] + p(\gamma(b)) \alpha(b) \left(1 - \gamma(b)\right) \left[\pi + [1 - p(\gamma(b)) \left(1 - \gamma(b)\right)] b^2 - T_{2}^{LF}(b)\right], \end{cases}
\]

or

\[
\Pi^{LF}(b) = \begin{cases} (1 - \alpha(b)) \left[\pi - T_{1}^{LF}(b)\right] + \alpha(b) \left(1 - \gamma(b)\right) \left[\pi - T_{2}^{LF}(b)\right] + \alpha(b) \left[p(\gamma(b)) \left(1 - \gamma(b)\right)\right] [1 - p(\gamma(b)) \left(1 - \gamma(b)\right)] b^2. \end{cases}
\]

The host government maximizes its expected welfare with respect to the MNF’s incentive com-

\(^{23}\)Note that there is nothing unknown about the local firm’s profit once the host government obtains the truthful report of \( b \) from the MNF.
patibility and individual rationality constraints as well as the LF’s individual rationality constraint:

\[
W = \max \int_b \left\{ E(T) + \phi \Pi^{LF}(b) \right\} \, dF(b), \text{ s.t.}
\]

\[
\Pi^{MNF}(b|b) \geq \Pi^{MNF}(\tilde{b}|b), \quad \forall b, \tilde{b} \in [\underline{b}, \overline{b}],
\]

\[
\Pi^{MNF}(b|b) \geq 0, \quad \forall b \in [\underline{b}, \overline{b}],
\]

\[
\int_b \Pi^{LF}(b) \, db \geq 0, \quad \forall b \in [\underline{b}, \overline{b}].
\]

where \( E(T) = (1 - \alpha(b)) T_1^{LF}(b) + \alpha(b) \left( T_2^{LF}(b) + T^{MNF}(b) \right) \) and \( \phi \leq 1 \) is the relative weight given to the local firm’s net (after-tax) profit.\(^{24}\)

**Proposition 1.** The optimal mechanism is given by the following

\[
T_1^{LF}(b) = T_1^{LF} = \pi,
\]

\[
T_2^{LF}(b) = (1 - \gamma(b)) \left\{ \pi + p(\gamma(b)) \left[ 1 - p(\gamma(b)) (1 - \gamma(b)) \right] b^2 \right\},
\]

\[
T^{MNF}(b) = \gamma(b) \pi + \frac{[1 - p(\gamma(b)) (1 - \gamma(b))] b^2}{2} - \int_b \left[ 1 - p(\gamma(b)) (1 - \gamma(b)) \right]^{\gamma(b)} b \, db,
\]

\[
\gamma(b) = \frac{b}{2 \left[ \frac{1 - F(b)}{f(b)} \right] + b} - \left( \frac{1 - p(\gamma(b))}{p(\gamma(b))} \right) \frac{2 \left[ \frac{1 - F(b)}{f(b)} \right]}{\frac{1 - F(b)}{f(b)} + b},
\]

\[
\alpha(b) = 1 \quad \forall b \in [\underline{b}, \overline{b}].
\]

**Proof.** The proof is given in Karabay (2010) and is thus omitted.

In this game, while regulating the MNF, the host government uses the LF to extract more information about the extra surplus created by the MNF. The LF plays a watchdog role and guarantees that the MNF reports its firm-specific advantage truthfully. Furthermore, the optimal mechanism dictates that the information rent given to the MNF is proportional to its share in the JV. When deciding on the MNF’s share, the host government faces the rent extraction-efficiency trade off: higher share means greater efficiency but also higher information rent for the MNF. Also,

\(^{24}\)This assumption implies that the host government values all a dollar from a tax revenue at least as highly as a dollar in the hands of the local firm.
the LF cannot get any rent and makes zero profit (its individual rationality constraint is satisfied *ex post*).

It is easy to see that in the optimal mechanism, the MNF’s share is positively related to its firm-specific advantage, $b$. The intuition is simple. The extra surplus the MNF generates depends on $b$ as well as the effort MNF exerts. The MNF decides on its effort level based on its stake in the project: the higher its stake, the higher effort it will put forth. Hence, when $b$ is high, the project has the potential to create a large surplus and to take advantage of this potential, the right incentives must be given to the MNF through allocating a large stake. Doing so, the host government can guarantee itself a sizable tax revenue. Note that using the mechanism given in Proposition 1, it is possible to find the host government’s expected welfare as

$$W = \pi + \int_0^1 \left( \frac{[1 - p(\gamma(b))(1 - \gamma(b))] b^2 - \frac{[1 - p(\gamma(b))(1 - \gamma(b))]^2}{2}}{b^2 \cdot [1 - p(\gamma(b))(1 - \gamma(b))]^2 b^2} \right) db,$$

If we substitute the optimal value of $\gamma(b)$ given Proposition 1, we obtain

$$W = \pi + \int_0^1 \left( \frac{b^3}{2 [1 - F(b)] + b} - \frac{b^4}{2 (1 - F(b)) + b} \right) b db.$$

**Example:** Assume that $b$ has a uniform distribution with a support $[0,1]$ such that $f(b) = 1$ and $F(b) = b$. In addition, assume for simplicity that $\pi = 0$ and $p(\gamma(b)) = 1 - \gamma(b)$. Then, the optimal mechanism is given as below

$$T_1^{LF} (b) = T_1^{LF} = \pi = 0,$$

$$T_2^{LF} (b) = \frac{2b^3(1 - b)}{(2 - b)^2},$$

$$T^{MNF} (b) = 12 \ln \left( \frac{2}{2 - b} \right) - \frac{2b(b^2 - 9b + 12)}{(2 - b)^2},$$

$$\gamma(b) = 1 - \sqrt{2(1 - b) \over 2 - b},$$

$$\alpha(b) = 1 \ \forall b \in [0,1].$$

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25 Asiedu and Esfahani (2001), using a large data set consisting of subsidiaries of U.S. Multinational Firms, conclude that equilibrium foreign ownership rises with the importance of Multinational Firms’ assets for production and declines with significance of local assets. Furthermore, foreign equity restrictions turn out to be consequential.
In addition, the host government’s expected welfare is given by 
\[ W = 4 \ln(2) - \frac{8}{3}. \]

[Insert Figure 1 here]

[Insert Figure 2 here]

**Optimal mechanism under collusion**

Here, it is assumed that the MNF and the LF can maintain a collusive agreement.\(^{26}\) All other assumptions are as before. Collusion is modeled as a side contract between the JV partners.\(^{27}\) We first consider a scenario in which the LF offers a take-it-or-leave-it offer to the MNF. In other words, the LF has the full bargaining power. However, as we will claim in the appendix, the optimal collusion-proof mechanism is independent of the identity of the agent initiating the collusion.

It is also important to note that the LF has an information disadvantage compared to the MNF. In the side-contracting stage, the LF would want to learn the MNF’s information and behave as the principal of the game. Due to the set up of the model, the LF as a principal nevertheless has more information than the host government. The mechanism design problem between the LF (principal) and the MNF (agent) consists of three-tuple:

\[ M2 \equiv \{ \alpha(b), \gamma(b), S(b) \}, \]

where \( \alpha(b) \in [0,1] \) is the probability that the LF allows the MNF take part in the production process, \( \gamma(b) \) is the ownership share of the MNF and \( S(b) \) is the side payment the MNF pays to the LF. As assumed before, the LF can observe the resulting surplus depending on its own share in the JV, i.e., as a function of \( p(\gamma(b)) \).

The collusion between the MNF and the LF, if any, occurs after accepting the grand contract by the host government.\(^{28}\) The timing of the game is as follows

1. The MNF learns the actual value of the firm-specific advantage \( b \).

\(^{26}\) This is a one-shot game. However, if one considers playing this game repeatedly then this commitment on collusion can be justified on reputational grounds.

\(^{27}\) It is assumed that the side contract is enforceable as is the grand contract.

\(^{28}\) A similar assumption is also maintained in Laffont and Martimort (1997), Faure-Grimaud, Laffont and Martimort (2003), Celik (2008) and Burlando and Motta (2014).
2. The host government designs a grand contract that states a lump-sum tax/subsidy and ownership share for the MNF and the LF given the report of $b$ by the MNF.

3. The MNF and the LF both decide whether to participate or not. If both decide to participate, the game continues. Otherwise, the game ends here.

4. The LF offers a collusion agreement to the MNF. This agreement states a side payment that the MNF needs to pay and an ownership share the MNF can have for the MNF’s each report of $b$.

5. The MNF decides whether to accept the collusion agreement or play the game non-cooperatively. If it decides to accept the collusion agreement, the game continues. Otherwise, they play non-cooperatively and we move to step 7.

6. The MNF announces its $b$ to the LF and its ownership share and side payment to the LF are determined according to the collusion agreement given in step 4.

7. The MNF announces its $b$ to the host government and the MNF’s and the LF’s ownership share and tax/subsidy are determined by the grand contract stated in step 2.

8. The MNF chooses its effort level.

9. Production takes place and respective payoffs are realized.

When there is a collusion between the MNF and the LF, the grand contract provided by the host government works as a threat point such that each party’s payoff must be at least as much as the collusion-free payoff of the game.\textsuperscript{30}

Given a mechanism, $M2$, denote by $\Pi_{\text{MNF} - C}(\hat{b}|b)$ the profit made by the MNF of type $b$ if it reports type $\hat{b}$. Thus,

$$\Pi_{\text{MNF} - C}(\hat{b}|b) = \alpha(\hat{b}) \left[ \gamma(\hat{b})\pi + p(\gamma(\hat{b})) \left[ \gamma(\hat{b})[eb - \frac{e^2}{2}] + \left(1 - p(\gamma(\hat{b}))\right) \left[ eb - \frac{e^2}{2} - S(\hat{b}) \right] \right] \right],$$

\textsuperscript{29}Notice that if the MNF rejects the side contract offer, it is plausible for the LF to change its belief about the MNF’s type. The updated belief will depend on the particular offer that is rejected. However, since the host government is restricted to use ownership share and tax and does not employ mechanisms involving communication, the LF’s updated belief is not relevant for the host government.

\textsuperscript{30}In the current setup, the host government provides direct incentives to the local firm rather than adopting a hierarchical structure by delegating regulation rights to the local firm. As shown in the appendix, both approaches generate the same expected welfare for the host government. However, if one assumes a small cost associated with the delegation, then this equality breaks down. Furthermore, whether there is delegation or not, ownership restriction policy continues to be utilized.
implying that
\[ e = \left[ 1 - p(\gamma(\hat{b})) \left( 1 - \gamma(\hat{b}) \right) \right] b. \]

Therefore, the MNF’s profit can be rewritten as
\[ \Pi_{MNF-C}(\hat{b}|b) = \alpha(\hat{b}) \left[ \gamma(\hat{b}) \pi + \frac{1 - p(\gamma(\hat{b})) \left( 1 - \gamma(\hat{b}) \right)}{2} b^2 - \bar{S}(\hat{b}) \right] . \]  

(5)

where \( \Pi_{MNF-C}(\hat{b}|b) \) is the collusion profit made by the MNF of type \( b \) if it reports \( \hat{b} \) to the LF when the LF has the full bargaining power. The truth-telling mechanism must be incentive compatible \((\Pi_{MNF-C}(\hat{b}|b) \geq \Pi_{MNF-C}(\tilde{b}|b))\) and individually rational \((\Pi_{MNF-C}(\hat{b}|b) \geq \Pi_{MNF}(\hat{b}|b))\). \(^{31}\)

Notice that the MNF’s profit given in equation (5) is exactly same as the one given in equation (2), where \( S(\hat{b}) \) is replaced by \( T_{MNF}(\hat{b}) \). This is not surprising since in a collusion-free setup the host government utilizes the LF’s information set to design its mechanism, \( M1 \). This implies that the LF can replicate the same expected surplus the host government can achieve. Under these circumstances, we state the following proposition.

**Proposition 2.** The optimal collusion-proof mechanism is given by

\[
T_{1}^{LF}(b) = T_{1}^{LF} = \pi, \\
T_{2}^{LF}(b) = \begin{cases} \\
\pi + \int_{b}^{\hat{b}} \left[ \gamma(\hat{b}) \pi + \frac{1 - p(\gamma(\hat{b})) \left( 1 - \gamma(\hat{b}) \right)}{2} b^2 - \frac{1 - p(\gamma(\hat{b})) \left( 1 - \gamma(\hat{b}) \right)}{2} b^2 \right] \, db \\
- \int_{b}^{\hat{b}} \left[ \gamma(\hat{b}) \pi + \frac{1 - p(\gamma(\hat{b})) \left( 1 - \gamma(\hat{b}) \right)}{2} b^2 - \frac{1 - p(\gamma(\tilde{b})) \left( 1 - \gamma(\tilde{b}) \right)}{2} b^2 \right] \, db \\
\end{cases} , \\
T_{MNF}(b) = \gamma(\hat{b}) \pi + \frac{1 - p(\gamma(\hat{b})) \left( 1 - \gamma(\hat{b}) \right)}{2} b^2 - \int_{\frac{b}{2}}^{b} \left[ 1 - p(\gamma(\tilde{b})) \left( 1 - \gamma(\tilde{b}) \right) \right] \frac{1}{2} b \, db , \]

\(^{31}\)Here, \( \Pi_{MNF}(b|b) \) represents the payoff of the MNF when it plays the game according to the grand contract offered by the host government.
\[
\gamma(b) = \frac{b}{2 \left[ \frac{1 - F(b)}{f(b)} + b \right]} + \left( 1 - \frac{p(\gamma(b))}{p(\gamma(b))} \right) \frac{2 \left[ \frac{1 - F(b)}{f(b)} \right]}{2 \left[ \frac{1 - F(b)}{f(b)} + b \right]},
\]
\[
\alpha(b) = 1 \forall b \in \left[ \frac{4}{5}, \frac{7}{8} \right].
\]

**Proof.** See Appendix.

The mechanism given in Proposition 1 is not collusion-proof. The optimal collusion-proof mechanism requires the local firm to become a residual claimant of the entire surplus after paying off the host government an *ex post* constant surplus net of a type dependent transfer. Moreover, the optimal mechanism under collusion achieves the same expected welfare for the host government as in the collusion-free setup, which is given in equation (4).

The critical point is that the LF has the same information set as the host government when the host government takes advantage of the watchdog role played by the LF in the absence of collusion. Thus, the LF can replicate what the host government does in a collusion-free environment and extract the same surplus. As a result, it is important to provide the right incentives to the LF to prevent collusion. The tax charged to the LF, which consists of a fixed fee minus a type dependent transfer, exactly accomplishes that. For example, in the mechanism given in Proposition 1 (collusion-free case), it is optimal for the MNF-LF collusion to report the firm-specific advantage \( b \) as always \( \frac{4}{5} \) to avoid higher taxation. In the current mechanism given in Proposition 2, it would not be beneficial to do, since it would result in negative profits for the LF.

To illustrate, let’s use our earlier example.

**Example continued.** Let’s continue with our earlier example, where \( b \sim Uniform[0, 1], \pi = 0 \) and \( p(\gamma(b)) = 1 - \gamma(b) \). Then, the optimal share and the side payment set by the LF for the MNF is given by:

\[
\gamma(b) = 1 - \sqrt{\frac{2(1 - b)}{2 - b}},
\]
\[
S(b) = 12 \ln \left( \frac{2}{2 - b} \right) - \frac{2b (b^2 - 9b + 12)}{(2 - b)^2} + \frac{2b^3 (1 - b)}{(2 - b)^2}.
\]
The optimal mechanism of the host government is given by

\begin{align*}
T_1^{LF} (b) &= T_1^{LF} = \pi = 0, \\
T_2^{LF} (b) &= 4 \ln(2) - \frac{8}{3} - \left[ 12 \ln \left( \frac{2}{2-b} \right) - \frac{2b(b^2 - 9b + 12)}{(2-b)^2} \right], \\
T^{MNF} (b) &= 12 \ln \left( \frac{2}{2-b} \right) - \frac{2b(b^2 - 9b + 12)}{(2-b)^2}, \\
\gamma (b) &= 1 - \sqrt{\frac{2(1-b)}{2-b}}, \\
\alpha (b) &= 1 \forall b \in [\frac{b}{2}, \frac{b}{2}] .
\end{align*}

The host government’s expected welfare is given by \( W = 4 \ln(2) - \frac{8}{3} \). Notice also that the side payment, \( S(b) \), the LF requires is equal to the total tax payment \( (T_2^{LF} (b) + T^{MNF} (b)) \) the host government obtains under collusion-free setup.

[Insert Figure 3 here]

[Insert Figure 4 here]

4. Conclusion

In recent years, many countries liberalized their policies on FDI. Nevertheless, these liberalization did not occur at the same rate across the board in every policy category. Kobrin (2005) documents that changes in regulation affecting foreign ownership accounted only 5.7% of the total changes. As a result, foreign ownership restrictions are still in place in many countries, even the ones that generally welcome FDI.

In Karabay(2010), one possible explanation on the widespread use of this type of restriction is provided such that under asymmetric information, ownership restrictions can be welfare-improving by reducing the information problem of the host government. In this paper, we show that this conclusion survives under collusion between joint venture partners. In particular, the collusion-proof contract employs the same ownership restriction rule as in the collusion-free setup. The only difference between these two contracts is that the local firm needs to be made the residual claimant of the JV. Furthermore, collusion does not impose any cost on the host government since the expected welfare under the second-best contract is still attainable.
Appendix

**Proof of Proposition 2.** Consider the case in which the LF has the full bargaining power. In this proof, we employ “selling the firm” idea of Che and Kim (2006). As shown in the main text, the LF has the capacity to mimic whatever the host government can achieve. Therefore, consider the hypothetical scenario where the host government delegates its regulation authority to the LF for a fixed fee. In this case, the LF can achieve the following

\[
\Pi_{LF-D}^{i} = \begin{cases} 
\pi + \left[1 - p(\gamma(b)) (1 - \gamma(b))\right] b^2 - \frac{\left[1 - p(\gamma(b)) (1 - \gamma(b))\right]^2 b^2}{2} \\
\sum_{\tilde{b}} \left[1 - p(\gamma(\tilde{b})) (1 - \gamma(\tilde{b}))\right] \frac{1}{2} b \tilde{d} \tilde{b},
\end{cases}
\]

where \(\Pi_{LF-D}^{i}\) represents the local firm’s *ex post* gross (before-tax) payoff under delegation. As a result, before learning the type of the MNF, the LF expects to obtain

\[
E[\Pi_{LF-D}^{i} (b)] = \pi + \int_{\tilde{b}} \left[1 - p(\gamma(b)) (1 - \gamma(b))\right] b^2 - \frac{\left[1 - p(\gamma(b)) (1 - \gamma(b))\right]^2 b^2}{2} \frac{1}{2} b \tilde{d} \tilde{b}, \tag{6}
\]

The expected gross (before-tax) payoff the LF obtains is identical to the host government’s welfare under collusion-free setup, which is given in equation (3).\(^{32}\) Since the participation constraint of the LF needs to be satisfied *ex ante*, the host government can simply charge a fixed fee that is equal to the amount given in equation (6) and can achieve the same welfare as in the collusion-free setup. The same logic can be implemented when designing the collusion-proof grand contract. In the grand contract, the host government still needs to satisfy the MNF’s incentive compatibility and individual rationality constraints. This can be easily done by implementing the same ownership restriction and the tax for the MNF as in the collusion-free setup. The trick is to change the tax that needs to be paid by the LF and make the LF the residual claimant. Recall that the LF’s net (after-tax) profit is given by (where we use \(\alpha(b) = 1, \forall b\))

\[
\Pi_{LF}^{i} (b) = (1 - \gamma(b)) \pi + p(\gamma(b)) (1 - \gamma(b)) [1 - p(\gamma(b)) (1 - \gamma(b))] b^2 - T_{LF}^{i} (b).
\]

\(^{32}\)Note that if we substitute the optimal value of \(\gamma(b)\) given in Proposition 2 into equation (6), we obtain the same expression as in equation (4).
The difference between $\Pi^{LF-D}(b)$ and $[\Pi^{LF}(b) + T^{LF}_2(b)]$, i.e., the difference between before-tax profits, is given by

$$\Pi^{LF-D}(b) - [\Pi^{LF}(b) + T^{LF}_2(b)] = \left\{ \begin{array}{ll} \gamma(b)\pi + \frac{1 - p(\gamma(b))(1 - \gamma(b))}{2}b^2 & \\
 - \int_{\tilde{b}}^{b} \left[ 1 - p(\gamma(\tilde{b}))(1 - \gamma(\tilde{b})) \right]^2 \tilde{b} d\tilde{b} & \\
\end{array} \right.$$

This is exactly the tax paid by the MNF under collusion-free setup. By transferring this amount to the LF and charging a fixed fee that is equal to the one in equation (6), the host government in effect transferring the ex post surplus to the LF while charging the expected value of this surplus as a fixed fee. Hence, the host government can obtain the same surplus under collusion-free setup while satisfying the LF’s participation constraint with equality. This is accomplished by setting

$$T^{LF}_2(b) = \left\{ \begin{array}{ll} \pi + \int_{\tilde{b}}^{b} \left[ 1 - p(\gamma(\tilde{b}))(1 - \gamma(\tilde{b})) \right] \tilde{b}^2 - \frac{1 - p(\gamma(b))(1 - \gamma(b))}{2}b^2 & \\
 - \int_{\tilde{b}}^{b} \left[ 1 - p(\gamma(\tilde{b}))(1 - \gamma(\tilde{b})) \right]^2 \tilde{b} d\tilde{b} & \\
\end{array} \right.$$

which makes the LF’s profit as

$$\Pi^{LF}(b) = \left\{ \begin{array}{ll} \left[ 1 - p(\gamma(b))(1 - \gamma(b)) \right] b^2 - \frac{1 - p(\gamma(b))(1 - \gamma(b))}{2}b^2 & \\
 - \int_{\tilde{b}}^{b} \left[ 1 - p(\gamma(\tilde{b}))(1 - \gamma(\tilde{b})) \right]^2 \tilde{b} d\tilde{b} & \\
\end{array} \right.$$

Thus, \( \int_{\tilde{b}}^{b} T^{LF}_2(b) db = 0 \), and host government’s welfare is as in equation (3).

Since with the host government’s grand contract design, both the MNF and the LF obtains the same surplus as in the side contract, there is no benefit for the JV partners to collude. Therefore, the grand contract is collusion proof.

\[33\] Note that $\Pi^{LF-D}(b)$ is the before-tax profit under delegation. In contrast, $\Pi^{LF}(b)$ is the after-tax profit. To obtain the before-tax profit, we need to add $T^{LF}_2(b)$. 

18
Finally, note that this result is independent of who makes the collusion offer. For example, consider the case where the informed party (the MNF) makes the collusion offer. Since the MNF is already informed on the realization of its type, its side contract offer may reveal its type (or some information about its type) to the LF. However, following the Myerson’s (1983) inscrutability principle, there is no loss of generality in assuming all types of the MNF offer the same side contract. Under this case, the side contract offer must be incentive compatible for the MNF. Besides, the payoffs of the MNF and LF must be at least as high as the grand contract where they play non-cooperatively. As a result, everything is the same, thus the same contract is offered as before. Hence, the host government’s collusion-proof grand mechanism is also the same as before. This shows that in order to design the collusion-proof contract, the host government does not need to know the exact nature of collusion, i.e., who makes the collusion offer.

References


Figure 1. The MNF’s Ownership Share
Figure 2. Expected Welfare and Tax Revenue without Collusion
Figure 3. Expected Welfare and Tax Revenue with Collusion
Figure 4. Profit of the JV partners with Collusion