Under One Roof:
Supply Chains and the Protection of Foreign Investment

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A.1 Theoretical Model

Baseline Model

The model in the paper has the following sequence of actions:

1. Nature chooses the host government's pressure to breach its contract with the target firm, $\alpha \sim U[\alpha_L, \alpha_H]$.
2. The target and its partner firms simultaneously decide how much effort, e_i, to invest in protecting the target.
3. The host government decides whether to break or honor the contract.

In this model, the players have the following preferences:

Utility functions

Player	Break	Honor
Host government	$\sigma v + \alpha$	$e_T + e_P$
Target firm	0	$v - e_T$
Partner firm	$\gamma_i v$	$(\gamma_i + \lambda_i)\, v - e_i$

where e_P denotes the aggregate effort of partner firms

Define: $\lambda_P \equiv \sum_i \lambda_i$. This is the aggregate value of the target firm's links to all of its partner firms.

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Extension 1: Complete Information

Claim: When players have complete information about α, there always exists an equilibrium in which the government honors its contract if $\alpha \leq (1 + \lambda_P - \sigma) v$.

Proof: Suppose that all players observe Nature's choice of α. The host government will honor the contract iff:

$$\sigma v + \alpha \leq e_T + e_P \quad \Leftrightarrow \quad \alpha \leq e_T + e_P - \sigma v \equiv \widehat{\alpha}$$

Case 1: Suppose $\alpha \leq -\sigma v$. Then $\sigma v + \alpha \leq 0$, meaning the government will honor the contract even if there is no effort. So each firm's best response is to not invest any effort: $e_T = 0$ for the target firm and $e_i = 0$ for all partner firms i.

Case 2: Suppose $-\sigma v < \alpha$. Consider a firm strategy profile $\overline{e}$ in which $e_T + e_P = \sigma v + \alpha$. This strategy profile will induce the government to always honor the contract, thereby giving the target utility $u_T = v - e_T$ and each partner firm i utility $u_i = (\gamma_i + \lambda_i) v - e_i$. No firm has incentive to unilaterally increase its effort because this will decrease the firm's payoff without affecting the host government's behavior. If any firm that is contributing effort in the strategy profile unilaterally decreases effort, the government will break the contract. For profile $\overline{e}$:

- if the target contributes effort ($e_T > 0$), it has no incentive to deviate down if and only if $0 \leq v - e_T \Leftrightarrow e_T \leq v$.
- if partner firm i contributes effort ($e_i > 0$), it has no incentive to deviate down if and only if $\gamma_i v \leq (\gamma_i + \lambda_i) v - e_i \Leftrightarrow e_i \leq \lambda_i v$

So the most aggregate effort that can be sustained in eqm is: $e_{max} = (1 + \lambda_P) v$. If $\alpha \leq e_{max} - \sigma v = (1 + \lambda_P - \sigma) v$, we can always construct an equilibrium effort profile that induces the government to honor its contract.

Extension 2: Cheap Talk

Claim: There does not exist a fully separating equilibrium when cheap talk is possible.

Proof: Suppose that after observing its type, α, the host government can send a cheap talk message. Let $m(\alpha)$ denote the message sent by type α. Suppose $m(\alpha)$ is a fully separating strategy. Then there exists an inverse function $\alpha(m)$ that represents the firms' beliefs about the government's type after hearing message m. Denote firm effort after hearing message m by: $e_T(m)$ and $e_i(m)$.

If the firms hear a message $\widetilde{m}$ sent by a type $\widetilde{\alpha} = \alpha(\widetilde{m}) \leq -\sigma v$, their best response is $e_T(\widetilde{m}) = 0$ and $e_i(\widetilde{m}) = 0$ for all partner firms i, and the host government will honor the contract. This gives the host government utility: $u_H(\widetilde{m}) = 0$.

Now consider type $\widehat{\alpha} = -\sigma v + \epsilon$ for small $\epsilon > 0$, and let $\widehat{m}$ denote the message sent by type $\widehat{\alpha}$. Three scenarios are possible:

- If $e_T(\widehat{m}) + e_P(\widehat{m}) > \sigma v + \widehat{\alpha}$, then at least one firm spends effort and the host government honors the contract. However, a firm that is contributing effort can unilaterally reduce its effort without change the host government's behavior, thereby increasing the firm's payoff. So this scenario cannot hold in equilibrium.

- If $e_T(\widehat{m}) + e_P(\widehat{m}) < \sigma v + \widehat{\alpha}$, then the host government breaks its contract, giving the target firm utility 0. If the target unilaterally deviates to effort $e' = \sigma v + \widehat{\alpha}$, then total effort is sufficient for the host government to honor the contract, giving the target firm utility: $v - e' = (1-\sigma)v - \widehat{\alpha}$. So the target has incentive to unilaterally deviate iff: $0 < (1-\sigma)v - \widehat{\alpha} \Leftrightarrow \widehat{\alpha} < (1-\sigma)v$. So this scenario cannot hold in equilibrium for type $\widehat{\alpha} = -\sigma v + \epsilon$.

- The only remaining scenario is that $e_T(\widehat{m}) + e_P(\widehat{m}) = \sigma v + \widehat{\alpha}$. This amount of firm effort induces the government to honor the contract. No firm has incentive to unilaterally increase its effort. If the target contributes effort, it has no incentive to deviate down iff: $0 \leq v - e_T(\widehat{m}) \Leftrightarrow e_T(\widehat{m}) \leq v$. If a partner firm contributes effort, it has no incentive to deviate down iff: $\gamma_i v \leq (\gamma_i + \lambda_i)v - e_i(\widehat{m}) \Leftrightarrow e_i(\widehat{m}) \leq \lambda_i v$. We can construct such a profile because the most aggregate effort that can be sustained in eqm is: $e_{max} = (1+\lambda_P)v > \sigma v + \widehat{\alpha} = \epsilon$.

So after hearing message $\widehat{m}$, the firms will spend effort such that: $e_T(\widehat{m}) + e_P(\widehat{m}) = \sigma v + \widehat{\alpha}$. This gives the host government utility $u_H(\widehat{m}) = \sigma v + \widehat{\alpha} = \epsilon$.

Because $\epsilon > 0$, type $\widetilde{\alpha}$ can always increase its payoff by switching from message $\widetilde{m}$ to $\widehat{m}$. Therefore, there does not exist a fully separating equilibrium.

Extension 3: Competitor Firms

Now suppose that there are two set of firms: partners (P) and competitors (C). Let ρ denote the number of partner firms and κ denote the number of competitor firms. These are their payoffs:

Utility functions

Player	Break	Honor
Host government	$\sigma v + \alpha + e_C$	$e_T + e_P$
Target firm	0	$v - e_T$
Partner firm	$\gamma_i v$	$(\gamma_i + \lambda_i)v - e_i$
Competitor firm	$(\mu_i + \beta_i)v - e_i$	$\mu_i v$

where e_P denotes the aggregate effort of partner firms
and e_C denotes the aggregate effort of competitor firms

Best response functions

The government honors the contract iff:

$$\sigma v + \alpha + e_C \leq e_T + e_P \quad \Leftrightarrow \quad \alpha \leq e_T + e_P - e_C - \sigma v \equiv \widehat{\alpha}$$

We focus on interior solutions, so the probability that the government honors the contract in equilibrium is $F(\widehat{\alpha})$ and the probability that the government breaks the contract is $1 - F(\widehat{\alpha})$.

For the target:

$$\begin{aligned}
EU_T &= F(\widehat{\alpha})(v - e_T) = \left(\frac{\widehat{\alpha} - \alpha_L}{A}\right)(v - e_T) \\
\frac{\partial EU_T}{\partial e_T} &= -\left(\frac{\widehat{\alpha} - \alpha_L}{A}\right) + \left(\frac{1}{A}\right)(v - e_T) = 0 \\
&\Leftrightarrow\ e_T = (1+\sigma)v - (e_T + e_P - e_C) + \alpha_L \\
&\Leftrightarrow\ e_T = \frac{1}{2}\left[(1+\sigma)v - e_P + e_C + \alpha_L\right]
\end{aligned}$$

For a partner firm i:

$$\begin{aligned}
EU_i &= [1 - F(\widehat{\alpha})]\gamma_i v + F(\widehat{\alpha})[(\gamma_i + \lambda_i)v - e_i] = \gamma_i v + \left(\frac{\widehat{\alpha} - \alpha_L}{A}\right)(\lambda_i v - e_i) \\
\frac{\partial EU_i}{\partial e_i} &= -\left(\frac{\widehat{\alpha} - \alpha_L}{A}\right) + \left(\frac{1}{A}\right)(\lambda_i v - e_i) = 0 \\
&\Leftrightarrow\ e_i = (\lambda_i + \sigma)v - e_T - e_P + e_C + \alpha_L \\
&\Leftrightarrow\ e_i = \frac{1}{2}\left[(\lambda_i + \sigma)v - e_T - e_{-i} + e_C + \alpha_L\right]
\end{aligned}$$

where e_{-i} is the aggregate effort of all partner firms except i.

For a competitor firm j:

$$\begin{aligned}
EU_j &= [1 - F(\widehat{\alpha})][(\mu_j + \beta_j)v - e_j] + F(\widehat{\alpha})\mu_j v = \mu_j v + \left(\frac{\alpha_H - \widehat{\alpha}}{A}\right)(\beta_j v - e_j) \\
\frac{\partial EU_j}{\partial e_j} &= -\left(\frac{\alpha_H - \widehat{\alpha}}{A}\right) + \left(\frac{1}{A}\right)(\beta_j v - e_j) = 0 \\
&\Leftrightarrow\ e_j = (\beta_j - \sigma)v + e_T + e_P - e_C - \alpha_H \\
&\Leftrightarrow\ e_j = \frac{1}{2}\left[(\beta_j - \sigma)v + e_T + e_P - e_{-j} - \alpha_H\right]
\end{aligned}$$

where e_{-j} is the aggregate effort of all competitor firms except j.

Equilibrium behavior

Define $\lambda_P \equiv \Sigma_{i \in P}\lambda_i$ and $\beta_C \equiv \Sigma_{j \in C}\beta_j$. Then rearranging the best response functions yields:

$$\begin{aligned}
e_P(e_T, e_C) &= \Sigma_{i \in P} e_i = \lambda_P v + \rho(\sigma v - e_T - e_P + e_C + \alpha_L) \\
&= \frac{(\lambda_P + \rho\sigma)v + \rho(e_C - e_T + \alpha_L)}{\rho + 1}
\end{aligned}$$

And:

$$\begin{aligned} e_C(e_T, e_P) &= \Sigma_{j \in C} e_j = \beta_C v + \kappa (e_T + e_P - e_C - \sigma v - \alpha_H) \\ &= \frac{(\beta_C - \kappa\sigma) v + \kappa (e_T + e_P - \alpha_H)}{\kappa + 1} \end{aligned}$$

Combining these functions yields:

$$\begin{aligned} e_P(e_T) &= \frac{[(\kappa+1)\lambda_P + \rho\sigma + \rho\beta_C] v + \rho(\kappa+1)\alpha_L - \rho\kappa\alpha_H - \rho e_T}{\rho + \kappa + 1} \\ e_C(e_T) &= \frac{[\kappa\lambda_P - \kappa\sigma + (\rho+1)\beta_C] v + \rho\kappa\alpha_L - \kappa(\rho+1)\alpha_H + \kappa e_T}{\rho + \kappa + 1} \end{aligned}$$

These can then be combined with the e_T best response function to yield the equilibrium strategy:

$$e_T^* = \frac{(\beta_C + \sigma - \lambda_P + \rho + \kappa + 1) v + (\kappa+1)\alpha_L - \kappa\alpha_H}{\rho + \kappa + 2}$$

More substitutions yield the remaining equilibrium strategies:

$$\begin{aligned} e_P^* &= \frac{[(\kappa+2)\lambda_P + \rho\sigma + \rho\beta_C - \rho] v + \rho(\kappa+1)\alpha_L - \rho\kappa\alpha_H}{\rho + \kappa + 2} \\ e_C^* &= \frac{[\kappa(1 + \lambda_P - \sigma) + (\rho+2)\beta_C] v + (\rho+1)\kappa\alpha_L - (\rho+2)\kappa\alpha_H}{(\rho + \kappa + 2)} \end{aligned}$$

So the equilibrium value of the cutpoint is:

$$\begin{aligned} \widehat{\alpha}^* &= e_T^* + e_P^* - e_C^* - \sigma v \\ &= \frac{(1 + \lambda_P - \sigma - \beta_C) v + (\rho+1)\alpha_L + \kappa\alpha_H}{\rho + \kappa + 2} \end{aligned}$$

Checking the corners

$$\begin{aligned} \alpha_L \leq \widehat{\alpha}^* &\Leftrightarrow (\kappa+1)\alpha_L \leq (1 + \lambda_P - \sigma - \beta_C) v + \kappa\alpha_H \\ \widehat{\alpha}^* \leq \alpha_H &\Leftrightarrow (1 + \lambda_P - \sigma - \beta_C) v + (\rho+1)\alpha_L \leq (\rho+2)\alpha_H \end{aligned}$$

Comparative statics

$$\frac{\partial\widehat{\alpha}^*}{\partial\lambda_i} = \frac{v}{\rho + \kappa + 2} > 0$$

$$\frac{\partial\widehat{\alpha}^*}{\partial\sigma} = \frac{-v}{\rho + \kappa + 2} < 0$$

$$\frac{\partial \widehat{\alpha}^*}{\partial v} = \frac{1+\lambda_P-\sigma-\beta_C}{\rho+\kappa+2} > 0 \quad \text{if } \sigma+\beta_C < 1+\lambda_P$$

$$\begin{aligned}
\widehat{\alpha}^*\left(\rho'+1\right) < \widehat{\alpha}^*\left(\rho'\right) \quad &\Leftrightarrow \quad \left(\rho'+\kappa+2\right)\left[\left(1+\lambda_P-\sigma-\beta_C\right)v+\left(\rho'+2\right)\alpha_L+\kappa\alpha_H\right] \\
&\quad\quad < \left(\rho'+\kappa+3\right)\left[\left(1+\lambda_P-\sigma-\beta_C\right)v+\left(\rho'+1\right)\alpha_L+\kappa\alpha_H\right] \\
&\Leftrightarrow \quad \left(\kappa+1\right)\alpha_L < \left(1+\lambda_P-\sigma-\beta_C\right)v+\kappa\alpha_H
\end{aligned}$$

Note that this is a condition that is necessary for an interior solution because it ensures that the contract is sometimes honored in eqm ($\widehat{\alpha}^* > \alpha_L$).

Extension 4: Variation in Firm Attributes

Suppose that the unit cost of effort and the unit benefit of effort are firm-specific. Let $\tau_T \geq 0$ and $\tau_i \geq 0$ represent the unit cost of effort for the target and partner firm i, respectively. Similarly, let $\beta_T \geq 0$ and $\beta_i \geq 0$ represent the benefit for the host government from the target and partner firm i, respectively. Then players have the following payoffs:

Utility functions

Player	Break	Honor
Host government	$\sigma v+\alpha$	$\beta_T e_T+\sum_{i\in P}\beta_i e_i$
Target firm	0	$v-\tau_T e_T$
Partner firm	$\gamma_i v$	$\left(\gamma_i+\lambda_i\right)v-\tau_i e_i$

Best response functions

The government breaks the contract iff:

$$\sigma v+\alpha \geq \beta_T e_T+\sum_{i\in P}\beta_i e_i \quad \Leftrightarrow \quad \alpha \geq \beta_T e_T+\sum_{i\in P}\beta_i e_i-\sigma v \equiv \widehat{\alpha}$$

We focus on interior solutions, so the probability that the government honors the contract in equilibrium is $F\left(\widehat{\alpha}\right)$ and the probability that the government breaks the contract is $1-F\left(\widehat{\alpha}\right)$.

For the target:

$$\begin{aligned}
EU_T &= F(\widehat{\alpha})(v-\tau_T e_T) = \left(\frac{\widehat{\alpha}-\alpha_L}{A}\right)(v-\tau_T e_T) \\
\frac{\partial EU_T}{\partial e_T} &= -\tau_T\left(\frac{\widehat{\alpha}-\alpha_L}{A}\right)+\left(\frac{\beta_T}{A}\right)(v-\tau_T e_T)=0 \\
&\Leftrightarrow \quad \beta_T\tau_T e_T = \beta_T v - \tau_T(\widehat{\alpha}-\alpha_L) \\
&\Leftrightarrow \quad e_T = \frac{v}{\tau_T}-\frac{1}{\beta_T}\left(\beta_T e_T+\sum_{i\in P}\beta_i e_i-\sigma v-\alpha_L\right) \\
&\Leftrightarrow \quad e_T = \frac{1}{2}\left[\frac{v}{\tau_T}-\frac{1}{\beta_T}\left(\sum_{i\in P}\beta_i e_i-\sigma v-\alpha_L\right)\right]
\end{aligned}$$

For a partner firm i:

$$\begin{aligned}
EU_i &= [1-F(\widehat{\alpha})]\gamma_i v + F(\widehat{\alpha})[(\gamma_i+\lambda_i)v-\tau_i e_i] = \gamma_i v + \left(\frac{\widehat{\alpha}-\alpha_L}{A}\right)(\lambda_i v-\tau_i e_i) \\
\frac{\partial EU_i}{\partial e_i} &= -\tau_i\left(\frac{\widehat{\alpha}-\alpha_L}{A}\right)+\left(\frac{\beta_i}{A}\right)(\lambda_i v-\tau_i e_i)=0 \\
&\Leftrightarrow \quad \beta_i\tau_i e_i = \beta_i\lambda_i v-\tau_i(\widehat{\alpha}-\alpha_L) \\
&\Leftrightarrow \quad e_i = \frac{\lambda_i}{\tau_i}v-\frac{1}{\beta_i}\left(\beta_T e_T+\sum_{i\in P}\beta_i e_i-\sigma v-\alpha_L\right) \\
&\Leftrightarrow \quad e_i = \frac{1}{2}\left[\frac{\lambda_i}{\tau_i}v-\frac{1}{\beta_i}\left(\beta_T e_T+\sum_{j\neq i}\beta_j e_j-\sigma v-\alpha_L\right)\right]
\end{aligned}$$

Equilibrium behavior

Then:

$$\begin{aligned}
\sum_{i\in P}\beta_i e_i &= v\sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right)-\rho\left(\beta_T e_T+\sum_{i\in P}\beta_i e_i-\sigma v-\alpha_L\right) \\
&\Leftrightarrow \quad \sum_{i\in P}\beta_i e_i(e_T) = \frac{\left[\sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right)+\rho\sigma\right]v-\rho\beta_T e_T+\rho\alpha_L}{\rho+1}
\end{aligned}$$

Combining the best response functions yields:

$$\begin{aligned}
e_T^* &= \frac{\left[\beta_T(\rho+1)-\tau_T\sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right)+\tau_T\sigma\right]v+\tau_T\alpha_L}{\beta_T\tau_T(\rho+2)} \\
\sum_{i\in P}\beta_i e_i^* &= \frac{\left[2\tau_T\sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right)+\tau_T\rho\sigma-\beta_T\rho\right]v+\tau_T\rho\alpha_L}{\tau_T(\rho+2)}
\end{aligned}$$

So the equilibrium value of the cutpoint is:

$$\begin{aligned}\widehat{\alpha}^* &= \beta_T e_T^* + \sum_{i\in P} \beta_i e_i^* - \sigma v \\ &= \frac{\left[\tau_T \sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right) - \tau_T\sigma + \beta_T\right] v + \tau_T\left(\rho+1\right)\alpha_L}{\tau_T\left(\rho+2\right)}\end{aligned}$$

Checking the corners:

$$\begin{aligned}\alpha_L < \widehat{\alpha}^* &\Leftrightarrow \tau_T\alpha_L < \left[\tau_T \sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right) - \tau_T\sigma + \beta_T\right] v \\ \widehat{\alpha}^* < \alpha_H &\Leftrightarrow \left[\tau_T \sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right) - \tau_T\sigma + \beta_T\right] v + \tau_T\left(\rho+1\right)\alpha_L < \tau_T\left(\rho+2\right)\alpha_H\end{aligned}$$

Comparative statics

$$\frac{\partial\widehat{\alpha}^*}{\partial\lambda_i} = \frac{\beta_i v}{\left(\rho+2\right)\tau_i} > 0$$

$$\frac{\partial\widehat{\alpha}^*}{\partial\sigma} = -\frac{v}{\rho+2} < 0$$

$$\frac{\partial\widehat{\alpha}^*}{\partial v} = \frac{\tau_T \sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right) - \tau_T\sigma + \beta_T}{\tau_T\left(\rho+2\right)} > 0 \quad\Leftrightarrow\quad \sigma < \sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right) + \frac{\beta_T}{\tau_T}$$

Note that this is a condition that is necessary for an interior solution because it ensures that the contract is sometimes honored in eqm ($\widehat{\alpha}^* > \alpha_L$).

$$\begin{aligned}\widehat{\alpha}^*\left(\rho'+1\right) < \widehat{\alpha}^*\left(\rho'\right) &\Leftrightarrow \left(\rho'+2\right)\left\{\left[\tau_T \sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right) - \tau_T\sigma + \beta_T\right] v + \tau_T\left(\rho'+2\right)\alpha_L\right\} \\ &\qquad < \left(\rho'+3\right)\left\{\left[\tau_T \sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right) - \tau_T\sigma + \beta_T\right] v + \tau_T\left(\rho'+1\right)\alpha_L\right\} \\ &\Leftrightarrow \left(\rho'+2\right)\tau_T\alpha_L < \left[\tau_T \sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right) - \tau_T\sigma + \beta_T\right] v + \tau_T\left(\rho'+1\right)\alpha_L \\ &\Leftrightarrow \tau_T\alpha_L < \left[\tau_T \sum_{i\in P}\left(\frac{\beta_i\lambda_i}{\tau_i}\right) - \tau_T\sigma + \beta_T\right] v\end{aligned}$$

Again, this is a condition that is necessary for an interior solution because it ensures that the contract is sometimes honored in eqm ($\widehat{\alpha}^* > \alpha_L$).

Extension 5: Other Forms of Enforcement

Suppose that when the host government decides to break its contract, there is some probability that this action fails: $q \in [0, 1]$. This failure could be caused by the domestic legal system, veto players, and/or other institutional constraints beyond firm effort. Then players have the following payoffs:

Utility functions

		Break	
Player	Honor	Failure (q)	Success ($1-q$)
Host government	$e_T + e_P$	0	$\sigma v + \alpha$
Target firm	$v - e_T$	v	0
Partner firm	$(\gamma_i + \lambda_i)\, v - e_i$	$(\gamma_i + \lambda_i)\, v$	$\gamma_i v$

Best response functions

The government honors the contract iff:

$$(1-q)(\sigma v + \alpha) \leq e_T + e_P \quad \Leftrightarrow \quad \alpha \leq \frac{e_T + e_P}{1-q} - \sigma v \equiv \widehat{\alpha}$$

We focus on interior solutions, so the probability that the government honors the contract in equilibrium is $F(\widehat{\alpha})$ and the probability that the government breaks the contract is $1 - F(\widehat{\alpha})$.

For the target:

$$\begin{aligned}
EU_T &= F(\widehat{\alpha})(v - e_T) + [1 - F(\widehat{\alpha})]\, qv = qv + \left(\frac{\widehat{\alpha} - \alpha_L}{A}\right)[(1-q)\, v - e_T] \\
\frac{\partial EU_T}{\partial e_T} &= -\left(\frac{\widehat{\alpha} - \alpha_L}{A}\right) + \left[\frac{1}{A(1-q)}\right][(1-q)\, v - e_T] = 0 \\
&\Leftrightarrow \; e_T = (1-q)(v - \widehat{\alpha} + \alpha_L) \\
&\qquad = (1-q)(1+\sigma)\, v + (1-q)\,\alpha_L - e_T - e_P \\
&\Leftrightarrow \; e_T = \frac{1}{2}[(1-q)(1+\sigma)\, v + (1-q)\,\alpha_L - e_P]
\end{aligned}$$

For a partner firm i:

$$\begin{aligned}
EU_i &= F\left(\widehat{\alpha}\right)\left[\left(\gamma_i+\lambda_i\right)v-e_i\right]+\left[1-F\left(\widehat{\alpha}\right)\right]\left(\gamma_i v+q\lambda_i v\right)=\gamma_i v+q\lambda_i v+\left(\frac{\widehat{\alpha}-\alpha_L}{A}\right)\left[\left(1-q\right)\lambda_i v-e_i\right] \\
\frac{\partial EU_i}{\partial e_i} &= -\left(\frac{\widehat{\alpha}-\alpha_L}{A}\right)+\left[\frac{1}{A\left(1-q\right)}\right]\left[\left(1-q\right)\lambda_i v-e_i\right]=0 \\
\Leftrightarrow &\quad e_i=\left(1-q\right)\left(\lambda_i v-\widehat{\alpha}+\alpha_L\right) \\
&\qquad =\left(1-q\right)\left(\lambda_i+\sigma\right)v+\left(1-q\right)\alpha_L-e_T-e_P \\
\Leftrightarrow &\quad e_i=\frac{1}{2}\left[\left(1-q\right)\left(\lambda_i+\sigma\right)v+\left(1-q\right)\alpha_L-e_T-e_{-i}\right]
\end{aligned}$$

Equilibrium behavior

Then:

$$\begin{aligned}
e_P\left(e_T\right) &= \sum_i e_i=\left(1-q\right)\left(\lambda_P+\rho\sigma\right)v+\rho\left(1-q\right)\alpha_L-\rho e_T-\rho e_P \\
&= \frac{\left(1-q\right)\left(\lambda_P+\rho\sigma\right)v+\rho\left(1-q\right)\alpha_L-\rho e_T}{\rho+1}
\end{aligned}$$

Combining this with the best response function above yields the equilibrium strategies:

$$\begin{aligned}
e_T^* &= \frac{\left(1-q\right)\left(1+\rho+\sigma-\lambda_P\right)v+\left(1-q\right)\alpha_L}{\rho+2} \\
e_P^* &= \frac{\left(2\lambda_P+\rho\sigma-\rho\right)\left(1-q\right)v+\rho\left(1-q\right)\alpha_L}{\rho+2}
\end{aligned}$$

So the equilibrium value of the cutpoint is:

$$\begin{aligned}
\widehat{\alpha}^* &= \frac{e_T^*+e_P^*}{1-q}-\sigma v \\
&= \frac{\left(1+\lambda_P-\sigma\right)v+\left(\rho+1\right)\alpha_L}{\rho+2}
\end{aligned}$$

Checking the corners:

$$\begin{aligned}
\alpha_L<\widehat{\alpha}^* &\Leftrightarrow \alpha_L<\left(1+\lambda_P-\sigma\right)v \\
\widehat{\alpha}^*<\alpha_H &\Leftrightarrow \left(1+\lambda_P-\sigma\right)v+\left(\rho+1\right)\alpha_L<\left(\rho+2\right)\alpha_H
\end{aligned}$$

Comparative statics

$$\frac{\partial\widehat{\alpha}^*}{\partial\lambda_i} = \frac{v}{\rho+2}>0$$

$$\frac{\partial\widehat{\alpha}^*}{\partial\sigma} = -\frac{v}{\rho+2} < 0$$

$$\frac{\partial\widehat{\alpha}^*}{\partial v} = \frac{1+\lambda_P-\sigma}{\rho+2} > 0 \quad \text{if } \sigma < 1+\lambda_P$$

$$\begin{aligned}
\widehat{\alpha}^*\left(\rho'+1\right) < \widehat{\alpha}^*\left(\rho'\right) \quad &\Leftrightarrow \quad \frac{(1+\lambda_P-\sigma)\,v+(\rho'+2)\,\alpha_L}{\rho'+3} < \frac{(1+\lambda_P-\sigma)\,v+(\rho'+1)\,\alpha_L}{\rho'+2} \\
&\Leftrightarrow \quad \left(\rho'+2\right)\left[(1+\lambda_P-\sigma)\,v+\left(\rho'+2\right)\alpha_L\right] \\
&\qquad < \left(\rho'+3\right)\left[(1+\lambda_P-\sigma)\,v+\left(\rho'+1\right)\alpha_L\right] \\
&\Leftrightarrow \quad \alpha_L < (1+\lambda_P-\sigma)\,v
\end{aligned}$$

Note that this is a condition that is necessary for an interior solution because it ensures that the contract is sometimes honored in eqm ($\widehat{\alpha}^* > \alpha_L$).

A.2 Empirical Analysis

Cross-national Evidence by Industry

Do economic links by industry affect *Arbitration* by industry? As discussed in footnote 28, we are skeptical of this alteration of Hypothesis 1. MNCs do not only have economic links with partners in their core industry. Parent MNCs exchange with subsidiaries in other industries through intra-firm trade, and MNCs purchase products from external partner firms in other industries through intermediate goods trade. See for example our discussion of the importance of services as part of manufactured goods global supply chains (Section 2).

Nonetheless, we perform an industry-level analysis, analogous to that of Table 2. First, we collect data on US out-FDI by industry; comprehensive data is available for one-digit NAICS codes 2 (mining and utilities), 3 (manufacturing), and 5 (services) (BEA). Second, we code all US-filed arbitrations with respect to the litigant firm's main business in the host country.[1] This forms our dependent variable, public international investment arbitrations filed by US firms in industry j against country i in year t, scaled by US FDI flows in industry j to country i in year t. Our main explanatory variable of interest is now *US intra-firm trade* while controlling for its industry category (NAICS 2, 3, or 5).

As in Table 2, we control for the presence of a *US BIT* and a state's *Polity* level. We report industry dummies, with NAICS 5 (services) excluded. First, we use a time-series cross-sectional

[1]Seven arbitrations are in agriculture (NAICS 1). Results are unchanged whether these observations are dropped or rolled in with NAICS 2 to create an agriculture/mining/utilities category.

model, with a lagged dependent variable and year fixed effects. Second, we use an averaged cross-sectional model. Also as in Table 2, we multiply the dependent variable by 1,000 for the ease of the reader.

As shown in Table A.1, the relationship between *Arbitration* and *US intra-firm trade*, controlling for industry, is negative as predicted but not statistically significant. Intra-firm trade in NAICS 2 or NAICS 3 does not have a significantly different relationship with *Arbitration* than does intra-firm trade in NAICS 5. As before, *US BIT* and *Polity* are not significant predictors of *Arbitration*. In short, results do not provide compelling support for the industry-specific alteration of Hypothesis 1. Cross-industry trade is an important factor in the results in Table 2.

Table A.1: Intra-firm Trade and Arbitration by Industry

	Dependent Variable: Arbitration	
	(A1)	(A2)
Arbitration (lagged)	-0.001	
	(0.000)	
US intra-firm trade (lagged)	-0.020	-0.341
	(0.017)	(0.314)
US BIT	0.289	1.774
	(0.179)	(1.439)
Polity (lagged)	-0.013	0.023
	(0.011)	(0.041)
NAICS 2†	0.432	2.913
	(0.277)	(2.494)
NAICS 3	0.138	2.306
	(0.110)	(2.115)
Constant	0.397	2.918
	(0.403)	(2.713)
Year dummies	Yes	No
R-squared (overall)	0.01	0.03
Observations	1,492	271
Countries	117	123

† Excluded industry category: services.
Note: Non-OECD countries. Robust standard errors are clustered by country.

Survey Evidence by Industry

In Table 5, we control for respondent industry using three categories: immobile industries, manufacturing, and services (excluded). We find that, compared to firms in services, firms in manufacturing are significantly less likely to have concerns about ownership transfer and significantly less likely to have aggregate breach concerns. There is no significant difference between the concerns of firms in immobile industries and services.

Here, we generate eight industry controls using disaggregated data on respondent industry (see Table 4(a)): energy/mining, engineering/environmental, telecommunications, transportation, manufacturing, finance/insurance, nonprofit/education, legal, and other services (excluded). Given our observation count, it is prudent to exclude other control variables in this analysis. As before, we use Tobit regressions with robust standard errors.

Table A.2 reports results. First, we again see expected results on covariates measuring the proportion of Russian suppliers. Relative to the excluded category of 75% and over, firms with 1–24% Russian suppliers are significantly more likely to report breach concerns in Models A3, A4, and A5. Coefficients for 25–49% and 50–74% are positive as expected but insignificant.

As in Table 5, manufacturing firms are significantly less likely to report breach concerns as compared to firms in general services. The coefficient magnitude is very similar to that in Table 5, which reinforces the distinction between manufacturing and (types of) services.[2] For studies of foreign investment, these results underscore the importance of accounting for industry beyond the traditional dichotomy of industries with immobile versus mobile assets.

Additionally, telecommunications firms are significantly more likely to report breach concerns than those in general services, which matches expectations that firms with significant sunk costs are more exposed to breach risk (Models A3 and A5). While the coefficient signs for firms in other industries classified as "immobile" are inconsistent, they are all insignificant. Legal firms are significantly less likely to report concerns over transfer of ownership than firms in general services, though a convenient post hoc explanation for this finding is that it simply is not feasible to transfer ownership of a law firm (Model A4). This result aside, the insignificance of covariates for other services support our compilation of them into a "services" category. The consistent results on manufacturing, and the difference between at least one "immobile" industry and services, tends to support our choice to aggregate industries into three categories in Table 5.

[2] In Table 5, the manufacturing coefficients are: -2.383 (Model 8) and -1.122 (Model 9). In Table A.2, the manufacturing coefficients are: -2.203 (Model A4) and -1.215 (Model A5).

Table A.2: Breach Concerns by Industry

Dependent Variable: Current and Future Concerns about Breach			
	(A3) Lowers value	(A4) Transfers ownership	(A5) Total breach
Proportion of Russian suppliers			
0	-0.084	-0.832	-0.334
	(0.822)	(0.901)	(0.738)
1-24%	2.083***	1.490**	1.633***
	(0.698)	(0.701)	(0.519)
25-49%	0.811	0.758	0.628
	(0.708)	(0.763)	(0.593)
50-74%	0.599	0.793	0.580
	(0.503)	(0.546)	(0.437)
Energy/Mining†	0.399	-0.828	-0.071
	(0.432)	(0.730)	(0.415)
Engineering/Environmental	-1.265	-1.023	-1.060
	(1.077)	(1.076)	(0.958)
Telecommunications	1.151**	0.763	0.876*
	(0.534)	(0.456)	(0.444)
Transportation	0.651	-0.734	-0.227
	(2.041)	(1.355)	(1.382)
Manufacturing	-0.607	-2.203***	-1.215**
	(0.763)	(0.816)	(0.588)
Finance/Insurance	0.173	0.664	0.057
	(0.647)	(0.909)	(0.639)
Nonprofit/Education	-0.392	-0.583	-0.462
	(0.875)	(0.811)	(0.745)
Legal	-0.623	-1.209*	-0.805
	(0.668)	(0.662)	(0.590)
Constant	1.849***	2.237***	2.124***
	(0.534)	(0.456)	(0.444)
Pseudo R^2	0.07	0.08	0.07
Observations	53	56	53

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Dependent variables range from 1-4.
† Excluded industry category: general services.
Note: Robust standard errors.