Quality of Institutions, Global Sourcing, and the Make-or-Buy Decision∗

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Abstract
Relational contracting on a trust basis is an integral part of many international transactions. I embed the Antràs and Helpman (2008) model into a repeated game environment in order to allow for relational contracting between cooperation parties. By analyzing explicit and implicit contracting in a unified framework, I show that these two contractual forms may act as complements and substitutes. In the latter case, an increase in formal contractibility can crowd out long-term relational contracts and reduce firm efficiency. In contrast, better informal enforceability unambiguously enhances firm performance and, thereby, a country’s attractiveness as an offshoring destination. I also find that, depending on whether cooperation parties enter a relational contract or not, underlying industry-specific characteristics affect the choice of the organizational form in a diametrically opposed manner.

Keywords: International organization of production, institutional quality, relational contracting, interaction of explicit and implicit contracts
JEL-Classifications: D02, D23, F14, L22

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1 Introduction

“[...] we think of good economic institutions as those that provide security of property rights [...]”

Acemoglu et al. (2005: 395)

“But nothing is implied about the actual form that property rights should take.”

Rodrik et al. (2004: 157)

It is widely recognized that country’s ability to enforce written contracts may constitute a source of its comparative advantage. For instance, Nunn (2007) estimates that contract enforcement explains more of the pattern of trade than physical capital and skilled labor combined. At the same time, a recent body of literature stresses the role of informal institutions and social norms as a safeguard of international transactions. To mention just one example, Guiso et al. (2009) show that lower bilateral trust leads to less trade between two countries and less direct and portfolio investment. By considering both formal and informal institutions in a unified framework, this theoretical paper poses as simple research question: Is the joint impact of both institutional forms on the international make-or-buy decision just a sum of two individual effects or do they interact? This paper contributes to the understanding of the interaction between the quality of formal and informal institutions by showing that written contracts and trust-based relational agreements can act both as complements and substitutes and affect the international make-or-buy decision in a diametrically opposed way.

The distinction between formal and informal institutions dates back to North (1990) and, albeit not always clear-cut, provides some fundamental insights. Consider a situation in which an international transaction between a final good producer and an intermediate supplier bears the risk of a hold-up (e.g., due to relationship-specific investment). At a high level of abstraction, there are two mechanisms to counter both parties’ potential opportunistic behavior. The first one is the law. If courts could verify and enforce contracts of any kind, cooperation parties could stipulate in advance an explicit agreement to trade intermediate goods of a certain quality at a given price, achieving thereby the first-best outcome.

However, most economists would agree that legal institutions are constrained in their ability to verify and enforce all subjects of the contract (especially in the international context), and contracting parties are bounded in their abilities to stipulate all relevant variables in an enforceable agreement (cf., e.g., Tirole (1999)). Thus, a great bulk of economic activities remains at least partially non-contractible. Yet, the rule of law is not the only institution which facilitates economic exchange. In his widely-cited study, Macaulay (1963: 58) argues that “businessmen often rely on ‘a man’s word’ in a brief letter, a hand-shake, or ‘common
honesty and decency’ – even when the transaction involves exposure to serious risks.”¹ In this paper, I consider these implicit “contracts” as a further enforcement mechanism and will refer to the country’s generalized level of trust as an informal institution which facilitates relational contracting.²

Existing theoretical models studying the impact of institutions on trade and foreign direct investment usually focus either on formal or informal institutions, thereby ignoring both the interaction between these two forms and the net balance of their effects.³ The need for a unifying theoretical framework becomes even more apparent in view of unexplained puzzles posed by recent empirical research. Using US firm-level data, Bernard et al. (2010a) study both the effect of and the interaction between two institutional measures, ‘country governance’ and ‘product contractibility’, on the international make-or-buy decision. With regard to the interaction of these two proxies, the authors find that improvements in country governance lead to the largest reductions in intrafirm trade if product contractibility is low.⁴ By analyzing bilateral trade patterns of European countries, a recent study by Yu et al. (2011) finds that trust and formal institutions are substitutes.⁵

I develop a simple model of global sourcing that can both explain the above mentioned patterns and provide further hypotheses for empirical research. This model exhibits several key features. First, I assume that countries differ not only with respect to the labor productivity and the quality of their formal institutions, as in Antràs and Helpman (2008), but also with regard to the level of generalized trust.⁶ Second, I assume that the production process is fragmented and that Northern headquarters may cooperate with manufacturing suppliers both in the North and in the South in order to produce final goods. Third, I assume that this cooperation may take place under two governance regimes: relational and spot contracting. In the first case, firms enter once and forever an implicit agreement concerning the quality of non-verifiable investments and the associated compensation, thereby mitigating the ex post hold-up problem. In case of the latter, firms negotiate each time after investment had been sunk about the surplus sharing and are thereby stuck with the hold-up problem. Fourth, headquarters decide on the ownership structure, i.e., whether to integrate a supplier or to

¹ For instance, McMillan and Woodruff (1999) and Johnson et al. (2002) find relational contracting to be the main governance mechanism in Vietnam, Poland, Romania, Russia, Slovakia and the Ukraine.
³ See Anderson (2004) and Dixit (2009, 2011a, b) for overviews of theoretical models which incorporate different aspects of formal and informal institutions into trade context. Dixit (2011a) concludes, however, that most of these models focus on one institutional form at a time.
⁴ In fact, Bernard et al. (2010b: 8) agree that “this non-linearity in the role of the country contracting environment is not formally developed in existing theoretical models.”
⁵ Ahlerup et al. (2009) find that trust and formal institutions are substitutes for economic growth.
⁶ I treat all three factors of comparative advantage as given and do not explore their origins. However, I discuss the effects of the change of these factors in the statics analysis.
acquire components through an arm’s length transaction on the market (outsourcing). Overall, my analysis thus allows for four organizational modes: \textit{spot integration}, \textit{spot outsourcing}, \textit{relational integration} and \textit{relational outsourcing}.

I obtain the following results. First, better contracting institutions may under certain conditions deteriorate agents’ ability to enter long-term implicit agreements. Intuitively, higher contractibility can make the loss of trust, that follows from the break-down of implicit agreements, less ‘costly’, since the relational contract can now be easier replaced by the one based on formal enforcement. By simulating the model numerically, I observe for the widest range of parameter values an inverted U relationship between contractibility and prevalence of relational contracts. More specifically, a country with less developed formal contractual institutions first experiences a rise in relational contracting due to better contractual verifiability. However, after a certain point, better formal institutions may crowd out the informal ones. Second, I show that higher level of trust fosters relational contracting and, therefore, increases country’s attractiveness as an offshoring destination. Third, I show that higher quality of contractual institutions has an ambiguous impact on the location attractiveness and derive conditions under which better formal enforcement may backfire. Fourth, I find that the degree of contractibility has a diverging impact on the prevalence of organizational modes (integration vs. outsourcing) depending on whether a cooperation is governed via spot or relational contracting. More specifically, while higher (lower) contractibility of supplier’s (final good producer’s) ex ante investments increases the relative attractiveness of \textit{spot} integration, it decreases the relative prevalence of \textit{relational} integration. The intuition behind these diverging impacts resides in the different headquarter’s objectives under two governance modes: While under spot contracting the organizational form is chosen so as to maximize ex ante investment incentives, the role of organizational mode under relational contracting is to minimize incentives to deviate from the implicit agreement. Fifth, I show that the relative attractiveness of integration is more likely to decrease in a country’s trust level, the lower (higher) is the contractibility of final good producer’s (supplier’s) activities.

\textbf{Related literature}. This paper relates to several strands of research. First and foremost, I complement the theoretical literature which studies the link between formal and/or informal institutions and trade (see Table 1).\footnote{See also Antràs (2011), Antràs and Rossi-Hansberg (2009) and Helpman (2006) for literature overviews.}

Grossman and Helpman (2005) provide a general equilibrium model with contract incompleteness in which northern final good producers decide whether to outsource intermediate production to a local or a foreign (southern) supplier. In their model, courts can verify only a fraction of a supplier’s relationship-specific investment and countries may differ with respect
to the degrees of contractual incompleteness. The authors find that an improvement in the northern legal system raises the relative profitability and the prevalence of outsourcing in the North. The effect of enhancement of contracting institutions in the South, however, is not monotonic and depends on various general equilibrium effects and the gap between both countries’ legal systems. Yet, GH (2005) abstract from modeling the international make-or-buy decision and the informal enforcement of non-contractible fraction of investment.

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Table 1: Selective list of papers that embed formal and informal contractual institutions into trade models.

Antràs and Helpman (2004) scrutinize the make-or-buy decision of final good producers in a general equilibrium model of North-South trade. In contrast to GH (2005), AH (2004) assume that both northern final good producers and suppliers (who may be located in either country) undertake relationship-specific investments and that these investments are ex ante fully non-contractible. Since cooperation parties negotiate about surplus sharing after investment had been sunk, double-sided hold-up arises. In anticipation of this ex post hold both parties underinvest ex ante. The key prediction of their model is that relative attractiveness of integration (as compared to outsourcing) increases in the relative importance of final good producer’s investments. Antràs and Helpman (2008) extend the framework by AH (2004) to allow for partial contractibility of investments. In doing so, they show that improvement of contractibility of suppliers’ (final good producers’) investments enhances (resp., decreases) the relative attractiveness of integration. Intuitively, an improvement of contractibility of particular party’s investment increases ceteris paribus this party’s ex post bargaining position and decreases her vulnerability towards ex post hold up. As a result, the relative attractiveness of organizational form which primarily incentivizes the counterpart increases, since investments of the counterpart become now more prone to ex post hold up.

All previously discussed papers model the cooperation between contracting parties as a static game, in which surplus sharing is negotiated on the spot. On the contrary, Corcos (2006) and Kukharskyy and Pflüger (2010) share the view that business transactions involving relationship-specific investments are the ones where long-term relationships are expected to predominate. Building on the relational contracts approach by Baker et al. (2002), the
authors account for the possibility of informal enforcement of non-verifiable investments in the repeated game context. C (2006) develops a partial equilibrium framework to study the effect of trade liberalization with respect to final and intermediate goods on the make-or-buy decision. In their general equilibrium model, KP (2010) argue that higher share of managers with long-term orientation (higher level of trust) may constitute a factor of country's comparative advantage and enhance its economic well-being. The present paper extends KP (2010) by the possibility of partial contractibility of investments in order to analyze the interaction between formal and informal institutions in international context.

Second, this paper contributes to the recent literature that considers the quality of institutions as a source of (Ricardian) comparative advantage. In their theoretical model, Acemoglu et al. (2006) show that better contracting institutions lead to the choice of more sophisticated technologies. Costinot (2007) provides theoretical model and supporting empirical evidence arguing that countries with better contracting institutions have comparative advantage in more complex industries. Similarly, Levchenko (2007) and Nunn (2007) provide both theoretical models and empirical results that confirm the link between contracting institutions and country’s comparative advantage. However, in contrast to the present contribution, none of the mentioned papers can draw all three checkmarks in table 1.

Third, my paper relates to the pioneering works by Baker et al. (1994) and Schmidt and Schnitzer (1995), who show that, under certain conditions, better formal contracts may destroy the incentive compatibility of the informal ones and, thereby, may crowd out the relational contracts. I complement their contribution by providing a richer set of results concerning the interaction between formal and informal institutions on the industry level.

The paper’s structure is as follows. Section 2 lays out the basic set up. Section 3 analyzes agents’ behavior in a one-shot game. Section 4 embeds this behavior into a repeated game context and characterizes the choice of governance mode. Section 5 and 6 scrutinize the choice of location and the make-or-buy decision, respectively. Section 7 concludes.

2 The basic set-up

The model economy consists of two countries: North and South, indexed by $\ell = N, S$. Each country is populated by a unity measure of consumers, who are symmetric in terms of their preferences. There are two types of internationally-immobile households: unskilled and skilled labor. Each household supplies inelastically one factor unit. While the North is endowed with both types of workers, the South only possesses the unskilled ones.

All households derive their utility from consumption of the traditional good $q_{T\ell}$ and the
bundle \( Q_\ell \) of differentiated varieties \( v \) of the modern good \( q_\ell(v) \). The utility function is assumed to be logarithmic quasi-linear with a CES sub-utility:

\[
U_\ell = q_\ell + \varepsilon \ln Q_\ell , \quad Q_\ell = \left[ \int_0^{n^w} q_\ell(v)^\sigma \, dv \right]^{1/\alpha} , \quad \varepsilon > 0 , \ 0 < \alpha < 1 , \ \ell = N, S ,
\]

where \( n^w \) is the mass of varieties (firms) available in the world economy. Parameter \( \varepsilon \) measures the intensity of preferences for differentiated goods and \( \alpha \) is a parameter related to the elasticity of substitution between any two varieties, \( \sigma = 1/(1-\alpha) \). The budget constraint is \( P_\ell Q_\ell + q_\ell = Y_\ell \), where \( Y_\ell \) is households’ income and \( P_\ell \equiv \left[ \int_0^{n^w} p_\ell(v)^{1-\sigma} \, dv \right]^{1/(1-\sigma)} \) is the price index of the modern goods, with \( p_\ell(v) \) denoting the price of variety \( v \) in \( \ell = N, S \).

Standard utility maximization implies equilibrium demand functions for the modern goods bundle, a single differentiated variety, and the traditional good, respectively:

\[
Q_\ell = \varepsilon P_\ell^{-1} , \quad q_\ell(v) = \varepsilon p_\ell(v)^{-\frac{1}{1-\alpha}} P_\ell^{\frac{\alpha}{1-\alpha}} , \quad q_\ell = Y_\ell - \varepsilon .
\]

I assume preference for differentiated goods to be small enough (i.e., \( \varepsilon < Y_\ell \)) to ensure positive consumption of the traditional good in equilibrium. The traditional good is produced in both countries under constant returns to scale and perfect competition. This good will be chosen as the numéraire. Production of one unit of output requires \( a_\ell \) units of unskilled labor in region \( \ell = N, S \). I assume that unskilled workers are more productive in the North than in the South, i.e, \( a_N < a_S \). The numéraire good is assumed to be costlessly traded between two countries, implying the same (unity) price in both regions. Consequently, the model exhibits a constant wage differential between two countries: \( w_N > w_S \).

The bundle of modern goods consists of a large variety of horizontally differentiated products. Production of each variety \( v \) requires two customized relationship-specific inputs: headquarter services \( X_h \) and manufacturing components \( X_m \), supplied by headquarters \( (H) \) and manufacturing suppliers \( (M) \), respectively. These inputs are costlessly combined to final goods according to the following Cobb-Douglas production function:

\[
q = \left( \frac{X_h}{\eta_h} \right)^{\eta_h} \left( \frac{X_m}{\eta_m} \right)^{\eta_m} , \quad X_j = \exp \left[ \int_0^1 \log x_j(i) \, di \right] , \quad j = h, m , \ 0 < \eta_h < 1 , \ \eta_m = 1-\eta_h ,
\]

where \( \eta_h \) represents the headquarter intensity in the production of variety \( v \). Following Antràs and Helpman (2008), I assume that each input \( j = h, m \) is produced with a set of input-specific activities \( x_j(i) \) indexed by points on the interval \([0,1]\). Provision of a single manufacturing activity \( x_m(i) \) in country \( \ell = N, S \) requires \( a_\ell \) units of unskilled labor. Production of headquarter services, however, requires one skilled worker as a fixed cost and
that $a_\ell$ units of unskilled labor per unit of output produced. Since skilled workers are available only in the North, $x_h(i)$ can be accomplished exclusively in $N$. I assume that final assembly of manufacturing components and headquarter services to final goods takes place in the $N$.

International trade in manufacturing components is costly and $\tau > 1$ units of $X_m$ need to be shipped from the South for one unit to arrive to the North. Alike, the shipment of final goods from $N$ to $S$ is associated with the same iceberg transport cost. Given the mill (fob.) price of final goods, $p_N(v)$, the price paid by consumers in the South is $p_S(v) = \tau p_N(v)$. Due to symmetry of final good producers, the price indexes prevailing in $N$ and $S$ can be expressed as $P_N = (n^w)^{-\alpha/\sigma} p_N(v)$ and $P_S = \tau P_N$, respectively. Combining these results with equation (2), yields total demand for variety $v$, $q(v) = \varepsilon p_N(v)^{-\frac{1}{\alpha}} P_N^{\frac{1}{\alpha}} + \tau \varepsilon (\tau p_N(v))^{-\frac{1}{\alpha}} (\tau P_N)^{\frac{1}{\alpha}}$. Using the inverse of this equilibrium demand together with (3) and the fact that $P_N = \varepsilon Q_N^{-\frac{1}{\alpha}}$ yields the revenue from the final goods production:

$$R(v) = 2^{1-\alpha} \varepsilon Q_N^{-\frac{1}{\alpha}} \left( \frac{X_h(v)}{\eta_h} \right)^{\alpha \eta_h} \left( \frac{X_m(v)}{\eta_m} \right)^{\alpha \eta_m}.$$  

(4)

Notice that this revenue endogenously depends on the aggregate demand level $Q_N$. While this aggregate consumption index is exogenous from the viewpoint of a single producer, it will be determined endogenously in the industry equilibrium. To save on notation, I drop the variety index $v$ from now on.

**Contractual environment and timing.** I follow Antràs and Helpman (2008) by assuming that input-specific activities are partially contractible. More specifically, while activities in the range $[0, \mu_{j\ell}]$, $0 \leq \mu_{j\ell} \leq 1$, $j = h, m$, $\ell = N, S$ can be stipulated ex ante in an explicit contract, the residual activities $i \in (\mu_{j\ell}, 1]$ cannot be verified by the courts and, therefore, remain non-contractible.

I depart, however, from Antràs and Helpman (2008) in several respects. First and foremost, I embed the one-shot game between headquarters and manufacturers into a repeated game with infinitely lived agents. In doing so, I aim at capturing the notion that business cooperations involving relationship-specific investments are the ones where we expect long-term relationships to predominate. The mere possibility of long-term cooperation provides room for the implicit contracting on the trust basis. More specifically, I allow the parties to govern non-verifiable activities (i.e., those in the range $(\mu_{j\ell}, 1]$) under two alternative governance modes: Spot ($S$) and Relational ($R$), discussed at length further below. Secondly, I rule out the assumption of ex ante lump-sum transfers between cooperation parties.

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8 One could easily extend the model by allowing for assembly in the South and incorporating “communication cost” associated with the transfer of headquarter services to the South. However, since the resulting effect of the change in communication cost is very similar to the effect of variation in $w_N$ in the current model, I refrain from modeling Southern assembly.
This assumption, albeit useful from the viewpoint of theoretical simplicity, is hard to map to anything in the real world, especially in the international context. Instead, I assume that potential suppliers may conduct promotional and/or rent-seeking activities $\rho_\ell$ (borne in terms of unskilled labor), which increase $M$’s probability $\theta(\rho_\ell)$ of being selected by $H$ as a cooperation partner. I further impose $\theta'(\rho_\ell) > 0$, $\lim_{\rho_\ell \to 0} \theta = 0$ and $\lim_{\rho_\ell \to \infty} \theta = 1$. Thirdly, I refrain from modeling productivity heterogeneity between firms.\footnote{As shown in Kukharskyy and Pflüger (2010), productivity differences between firms do not affect neither the choice of governance mode ($S$ vs. $R$) nor the make-or-buy decision as long as the assumption of organization-specific fixed cost is eliminated from the Antràs and Helpman (2004) model.}

The timing of events is as follows (cf. fig. 1):

I. The headquarter chooses the location $\ell \in \{N, S\}$ for production of manufacturing components. A large pool of potential suppliers anticipates future profits that can be earned via cooperating with $H$ and undertakes promotional activities $\rho_\ell$. Subsequently, $H$ selects one of the (symmetric) manufacturing suppliers to cooperate with.

II. The headquarter chooses the governance mode $G$: Spot ($S$) vs. Relational ($R$).\footnote{For the sake of simplicity, I first ignore the choice of organizational form. However, I take up the make-or-buy decision in section 3.}

1. The consequent timing under spot contracting is as follows (see $S$-path in fig. 1):

$t_1$: $H$ and $M$ stipulate the following two components in the explicit contract: both parties’ contractible ($c$) activities $\{x_{jcl}(i)\}_{i=0}^{\mu_j}$ and the commitment of $H$ to compensate $M$’s contractible activities with their marginal revenue product.

$t_2$: Both parties accomplish contractible activities and choose simultaneously and independently the amount of remaining non-contractible ($n$) activities, $\{x_{jn}(i)\}_{i=0}^{\mu_{j}}$.

$t_3$: $H$ and $M$ negotiate about the compensation of the latter’s contribution with regard to non-contractible activities. I assume that $H$ negotiates a share $\beta_{h\ell}$ of future revenue $R^S_\ell$ net of contractible payments, while $M$ bargains a share $\beta_{m\ell} = 1 - \beta_{h\ell}$ of the net revenue. These shares are stipulated explicitly.

$t_4$: Manufacturing inputs are transferred to headquarters, who combine them with headquarter services to final goods according to (3). The resulting output $q^S_\ell$ is sold in both countries.

$t_5$: The revenue is distributed between parties according to sharing rules stipulated in $t_1$ and $t_3$.

$R$: The timing under relational contracting is as follows (see $R$-path in fig. 1):
$t_1$: $H$ and $M$ enter the following *implicit* agreement: both parties commit to provide the first-best level of non-verifiable activities $\{x_{jn\ell}(i)\}_{i=\mu_{j\ell}}^1$. Furthermore, $H$ commits to pay a bonus $B_\ell$ to the supplier, if the latter sticks to this agreement.

$t_2$: Both parties’ contractible activities $\{x_{jc\ell}(i)\}_{i=0}^{\mu_{j\ell}}$ and the commitment of $H$ to compensate $M$’s contractible activities with their marginal revenue product are stipulated in the *explicit* contract.

$t_3$: Both parties accomplish contractible activities and choose simultaneously and independently the amount of remaining non-contractible activities, $\{x_{jn\ell}(i)\}_{i=\mu_{j\ell}}^1$.

$t_4$: Components are transferred to $H$ and final goods $q_R^\ell$ are produced and sold.

$t_5$: The revenue is distributed according to sharing rules stipulated in $t_1$ and $t_2$.

III. The product cycle laid down above is repeated in all future periods $t = 0, \ldots, \infty$.

This game can be solved through backward induction. In the next section I explore investment decisions of $H$ and $M$ and the corresponding firm profits in a single product cycle $t = 0$ under a given governance mode $G \in \{S, R\}$. Next, I extrapolate these results for all $t = 0, \ldots, \infty$. Subsequently, I move one step back and analyze $H$’s choice of governance mode. Lastly, $H$’s choice of the supplier’s location $\ell \in \{N, S\}$ will be determined.

### 3 One-shot game

**Explicit contracts.** Before discriminating between two alternative governance modes, consider first their common feature: explicit contracts with regard to verifiable activities. Under either governance mode firms stipulate explicitly the level of contractible activities $x^G_{jc\ell}$ which maximizes joint profits:

$$
\max_{\{x_{hc\ell}(i)\}_{i=0}^{\nu_{hc\ell}} \{x_{mc\ell}(i)\}_{i=0}^{\nu_{mc\ell}}} \pi^G_\ell = R^G_\ell - c_{hc\ell} \int_0^1 x_{hc\ell}(i) di - c_{mc\ell} \int_0^1 x_{mc\ell}(i) di \Rightarrow x_{jc\ell}(i) = x^G_{jc\ell} = \left( \frac{\eta_j}{c_j} \right) \alpha R^G_\ell, \ \forall i \in [0, \mu_{j\ell}],
$$
where \( c_{hN} = c_{hS} = c_{mN} = w_N \), and \( c_{mS} = \tau w_S \) are defined for the ease of notation. Using \( x_{jcl}^{g} \) in (4), we obtain the revenue in this cooperative game:

\[
R_{\ell}^{g} = \left( Z_{\ell} \left[ \exp \sum_{j=h,m} \alpha_{j\ell} \int_{\mu_{j\ell}}^{1} \log x_{j\ell}(i) di \right] \right)^{\frac{1}{1-\alpha_{\ell}}},
\]

where \( Z_{\ell} = 2^{1-\alpha_{\ell}} \varepsilon Q_{N}^{-\alpha_{\ell}} \alpha_{\omega}^{\alpha_{\ell}} \eta_{h}^{-\alpha_{\omega}} \eta_{m}^{-\alpha_{\omega}} \left( \frac{\eta_{h}}{c_{h\ell}} \right)^{\alpha_{z\ell}} \left( \frac{\eta_{m}}{c_{m\ell}} \right)^{\alpha_{z\ell}} \), \( z_{j\ell} \equiv \eta_{j\ell} \mu_{j\ell} \), \( z_{\ell} \equiv z_{h\ell} + z_{m\ell} \).

Recall that all contractible activities \( \mu_{j\ell} x_{jcl}^{g} \) are rewarded with their marginal revenue product. Hence, the joint revenue net of compensations for contractible activities is given by \( (1 - \alpha_{\ell}) R_{\ell}^{g} \) under either governance mode \( G \in \{S, R\} \). In the following, I discuss how the choice of the governance mode affects the distribution of this net payoff between parties.

### 3.1 Spot governance

Consider stage \( t_2 \) of the spot game. At this stage, \( H \) and \( M \) choose independently and simultaneously their levels of non-contractible activities \( i \in \{\mu_{j\ell}, 1\} \). Both players’ maximization problems and the resulting Nash equilibrium of the non-cooperative game are given by

\[
\max_{\{x_{j\ell}(i)\}_{i=\mu_{j\ell}}} \beta_{j\ell}(1 - \alpha_{\ell}) R_{\ell}^{S} - c_{j\ell} \int_{\mu_{j\ell}}^{1} x_{j\ell}(i) di \quad \Rightarrow x_{j\ell}(i) \equiv x_{j\ell m}^{S} = \beta_{j\ell} \left( \frac{\eta_{j}}{c_{j\ell}} \right) \alpha R_{\ell}^{S}, \quad \forall i \in \{\mu_{j\ell}, 1\}.
\]

It can be immediately seen from comparison of \( x_{j\ell m}^{S} \) with \( x_{jcl}^{g} \) for any given \( R_{\ell}^{g} = R_{\ell}^{S} \) that \( x_{j\ell m}^{S} < x_{jcl}^{g} \). Intuitively, absent complete contracts each party anticipates to be held up by its cooperation partner ex post and underinvests with regard to non-verifiable activities.

Utilizing \( x_{j\ell m}^{S} \) in \( R_{\ell}^{g} \) from (5) yields the revenue under spot contracting:

\[
R_{\ell}^{S} = (\beta_{h\ell}^{\alpha_{\omega h}} \beta_{m\ell}^{\alpha_{\omega m}}) \frac{1}{1-\alpha} \left( c_{h}^{-\alpha_{\omega h}} c_{m}^{-\alpha_{\omega m}} \right)^{\frac{1}{1-\alpha}} 2AEQ_{N}^{-\frac{1}{1-\alpha}},
\]

where \( A \equiv \alpha \frac{1}{1-\alpha} \), \( E \equiv \varepsilon \frac{1}{1-\alpha} \), \( \omega_{j\ell} \equiv \eta_{j}(1 - \mu_{j\ell}) \) are constants, \( \omega_{j\ell} \in (0, 1) \), \( j = h, m, \ell = N, S \).

Bearing in mind that \( \pi_{H\ell}^{S} = \beta_{h\ell}(1 - \alpha_{z\ell}) R_{\ell}^{S} - c_{h\ell}(1 - \mu_{h\ell}) x_{h\ell m}^{S} \) and \( \pi_{M\ell}^{S} = \beta_{m\ell}(1 - \alpha_{z\ell}) R_{\ell}^{S} - c_{m\ell}(1 - \mu_{m\ell}) x_{m\ell m}^{S} \) and utilizing \( R_{\ell}^{S} \) and \( x_{j\ell m}^{S} \) therein yields \( H \)’s and \( M \)’s operating profits:

\[
\pi_{H\ell}^{S} = \beta_{h\ell} \left( \beta_{h\ell}^{\alpha_{\omega h}} \beta_{m\ell}^{\alpha_{\omega m}} \right) \frac{1}{1-\alpha} (1 - \alpha(1 - \omega_{m})) \left( c_{h}^{-\alpha_{\omega h}} c_{m}^{-\alpha_{\omega m}} \right)^{\frac{1}{1-\alpha}} 2AEQ_{N}^{-\frac{1}{1-\alpha}},
\]

\[
\pi_{M\ell}^{S} = \beta_{m\ell} \left( \beta_{h\ell}^{\alpha_{\omega h}} \beta_{m\ell}^{\alpha_{\omega m}} \right) \frac{1}{1-\alpha} (1 - \alpha(1 - \omega_{h})) \left( c_{h}^{-\alpha_{\omega h}} c_{m}^{-\alpha_{\omega m}} \right)^{\frac{1}{1-\alpha}} 2AEQ_{N}^{-\frac{1}{1-\alpha}}.
\]

It can be immediately seen that \( \pi_{H\ell}^{S} \) and \( \pi_{M\ell}^{S} \) are positive for all possible parameter values.

Consider next both parties’ participation constraints. Potential manufacturing suppliers
anticipate ex post profit opportunities and adjust ex ante their promotional activities in order to increase their probability of being selected as a cooperation partner. The assumption of a large pool of potential suppliers implies \( \theta(\rho_t) \pi^S_{M\ell} - w_\ell \rho_t = 0 \) in equilibrium. In case of headquarters, one skilled worker (entrepreneur) is needed in order to start up a \( H \) firm. Since this entrepreneur is a scarce factor, she will appropriate all \( H \)'s operating profits. Yet, a skilled worker will be willing to establish a new enterprise, instead of being employed as an unskilled worker, as long as the associated reward is higher than her opportunity cost, i.e. \( \pi^S_{H\ell} \geq w_N \). I assume in the following that \( H \)'s participation constraint always holds.

Notice that both parties' profits (\( \pi^S_{H\ell} \) and \( \pi^S_{M\ell} \)) depend via \( \omega^j = \eta^j(1 - \mu^j) \) on the fraction of contractible activities, \( \mu^j \). Hence, joint profits under spot contracting, \( \pi^S_\ell = \pi^S_{H\ell} + \pi^S_{M\ell} \) are also dependent on \( \mu^j \). The following Lemma establishes these relationships:

**Lemma 1.** It holds: (i) \( \frac{\partial \pi^S_{H\ell}}{\partial \mu^j} > 0 \) for all \( j = h, m \); (ii) \( \frac{\partial \pi^S_{H\ell}}{\partial \mu^j} > 0 \) and \( \frac{\partial \pi^S_{M\ell}}{\partial \mu^j} > 0 \); (iii) the sign of \( \frac{\partial \pi^S_{H\ell}}{\partial \mu^m} \) (resp., \( \frac{\partial \pi^S_{M\ell}}{\partial \mu^m} \)) is ambiguous and is more likely to be positive the higher \( \beta^h \) and \( \eta^m \) (resp., \( \beta^m \) and \( \eta^h \)) and the lower \( \mu^m \) (resp., \( \mu^h \)); (iv) \( \frac{\partial \pi^S_{M\ell}}{\partial \mu^m} < 0 \) if and only if \( \beta^m > e^{-\frac{1}{1-\alpha(1-\omega^m)}} \).

**Proof.** See Appendix A.

In the heart of part (i) of Lemma 1 lies the above mentioned finding that the level of non-contractible activities is below the first-best optimal level of contractible activities. Since higher \( \mu^j \) increases the relative weight of contractible activities in production, the joint underinvestment decreases and joint profits increase. The reaction of individual profits, however, depends on whose fraction of contractible activities increases. Part (ii) of Lemma 1 implies that each party is better off if a larger fraction of her own activities becomes contractible. Part (iii) shows that the effect of the increase in contractibility of the counterpart’s activities on the profits of a particular party is ambiguous. To give the intuition for these two results, consider exemplary an increase in \( \mu^h \). Since \( H \) now becomes less exposed towards ex-post hold-up, the headquarter invests more ex ante, thereby increasing the revenue \( R^S_\ell \) and, accordingly, her own profits. This increase in \( R^S_\ell \) also affects positively \( M \)'s profits. Yet, an increase in \( \mu^h \) entails a further effect, which influences \( \pi^S_{M\ell} \) in opposing direction. Higher \( \mu^h \) implies a lower bargaining chip, which ceteris paribus decreases \( M \)'s profits. This second (negative) effect is less important for \( M \) the higher is her ex post bargaining share \( \beta^m \), the more headquarter investments relatively to manufacturing activities had been sunk (i.e, the higher is \( \eta^h \)), and the lower is the share \( \mu^h \) of \( H \)'s activities covered by explicit contracts. Part (iv) of Lemma 1 provides the necessary condition for \( \frac{\partial \pi^S_{M\ell}}{\partial \mu^m} < 0 \) to hold.
3.2 Relational governance

Consider stage $t_1$ of the relational game. At this stage $H$ and $M$ implicitly commit to provide non-contractible activities in the amount that maximizes joint profits:

$$\max \left\{ (1 - \alpha z_i) R_{H}^R - \sum_{j=h,m} c_{j\ell} \int_{\mu_{j\ell}}^{1} x_{j\ell}(i) di \right\} \Rightarrow x_{j\ell}(i) \equiv x_{j\ell}^R = \left( \frac{\eta_i}{c_{j\ell}} \right) \alpha R_{H}^R, \; \forall i \in (\mu_{j\ell}, 1].$$

Notice that for any given $R_{H}^R = R_{G}^G$ the amount of non-contractible activities $x_{j\ell}^R$ is equal to the first-best level of contractible activities, $x_{j\ell}^G$ from section 3. In other words, both parties implicitly agree not to underinvest with regard to non-contractible activities. Furthermore, the headquarter commits to pay manufacturing supplier a bonus $B_{\ell}$, if the latter provides the level of non-cooperative activities, $x_{m\ell}^R$ agreed upon in the implicit contract. Utilizing $x_{j\ell}^R$ in $R_{G}^G$ from (5) yields the revenue under relational contracting:

$$R_{H}^R = (c_{H\ell}^{-\alpha n_{H}} c_{m\ell}^{-\alpha n_{M}})^{1-\alpha} 2AEQ^{1-\alpha} N. \quad (8)$$

It is apparent from comparison of (6) and (8) that $R_{H}^R > R_{S}^S$ for all $\beta_{\ell}, \omega_{\ell}, \alpha \in (0, 1)$. This is a direct implication of the fact that both parties provide under relational contracting a higher amount of non-contractible activities as compared to spot contracting, i.e. $x_{m\ell}^R > x_{m\ell}^S$.

The operating profits of headquarter and manufacturing supplier are given, respectively, by

$$\pi_{H\ell}^R = (1 - \alpha (1 - \omega_{m\ell})) \left( c_{H\ell}^{-\alpha n_{H}} c_{m\ell}^{-\alpha n_{M}} \right)^{1-\alpha} 2AEQ^{1-\alpha} N - B_{\ell} \equiv \Pi_{H\ell}^R - B_{\ell},$$

$$\pi_{M\ell}^R = B_{\ell} - \alpha \omega_{m\ell} \left( c_{H\ell}^{-\alpha n_{H}} c_{m\ell}^{-\alpha n_{M}} \right)^{1-\alpha} 2AEQ^{1-\alpha} N \equiv B_{\ell} - C_{M\ell}^R,$$

where $\Pi_{H\ell}^R$ and $C_{M\ell}^R$ are defined for the ease of notation. I show in section 4 that a bonus, which renders relational contract self-enforcing, implies $\pi_{M\ell}^R > 0$. Hence $M$’s participation constraint is always fulfilled. Furthermore, I derive therein a sufficient condition for $H$ to be willing to participate in relational instead of spot contracting, i.e. $\pi_{H\ell}^R \geq \pi_{H\ell}^S$.

Define $\pi_{\ell}^R \equiv \pi_{H\ell}^R + \pi_{M\ell}^R$ as the joint profits under relational contracting. The following Lemma establishes that this overall surplus is higher than joint profits in the spot game:

**Lemma 2.** It holds $\pi_{\ell}^R > \pi_{\ell}^S$ for all parameter values.

**Proof.** See Appendix B.
in the relational game is higher compared to the spot game.

3.3 Deviation path

Since the relational contract is implicit, each party may renege on it by providing a suboptimal level of non-contractible activities. If either party deviates (D) from the implicit agreement, the relational contract is broken, and the resulting revenue \( R^D \) net of contractible payments is distributed between \( H \) and \( M \) according to ex post bargaining with exogenous shares \( \beta_h \) and \( \beta_m \).

Assume that party \( J = H, M \) sticks to the relational agreement and provides first-best efficient level of activities both in the contractible and non-contractible component, i.e. \( x^R_{jk\ell} = x^R_{jm\ell} = \left( \frac{\eta}{\alpha_c} \right) \alpha R^R_{\ell} \), where \( R^R_{\ell} \) is given by (8). In contrast, her counterpart \( K = H, M, K \neq J \), while providing first-best efficient level of activities in the contractible component, \( x^R_{k\ell} = \left( \frac{\eta}{\alpha_c} \right) \alpha R^R_{\ell} \), reneges on relational contract and delivers \( x^D_{k\ell}(i) \) for all non-contractible activities \( i \in (\mu_{k\ell}, 1), k = h, m, k \neq j \). Party \( K \)'s maximization problem reads:

\[
\max_{\{x^D_{k\ell}(i)\}_{i=\mu_{k\ell}}} \beta_{k\ell}(1-\alpha z_i)R(x^R_{jk\ell}, x^R_{jm\ell}, x^R_{k\ell}, x^D_{k\ell}(i)) - c_{k\ell} \int_{\mu_{k\ell}}^{1} x^D_{k\ell}(i) \, di \Rightarrow x^D_{k\ell}(i) \equiv x^D_{k\ell} = \beta_{k\ell} \left( \frac{\eta}{c_{k\ell}} \right) \alpha R^D_{k\ell},
\]

where

\[
R^D_{k\ell} = \beta_{k\ell}^{\frac{\alpha_k}{1-\alpha k}} \left( c_{h\ell}^{-\alpha_h} c_{m\ell}^{-\alpha_m} \right)^{\frac{1}{1-\alpha}} 2AEQ_N^{\frac{1}{1-\alpha}}.
\]

It can be easily verified that \( x^S_{knl} < x^D_{knl} < x^R_{knl} \). In words, on the deviation path party \( K \) underinvests as compared to the amount specified in the relational agreement, but still invests more than in the spot game. Similarly, the following gradation of revenues results from comparison of (6), (8) and (10): \( R^S_{l} < R^D_{k\ell} < R^R_{\ell} \). Denote by \( \pi^DH_{H\ell} \) (reps. \( \pi^DM_{M\ell} \)) party \( H \)'s (reps. \( M \)'s) on the deviation path. These profits are given by:

\[
\pi^DH_{H\ell} = \beta_{h\ell} \left[ \beta_{h\ell}^{\frac{\alpha_h}{1-\alpha_h}} \left( 1 - \omega_{h\ell} \right) - \alpha \left( 1 - \left( \omega_{h\ell} + \omega_{m\ell} \right) \right) \right] \left( c_{h\ell}^{-\alpha_h} c_{m\ell}^{-\alpha_m} \right)^{\frac{1}{1-\alpha}} 2AEQ_N^{\frac{1}{1-\alpha}}
\]

\[
\pi^DM_{M\ell} = \beta_{m\ell} \left[ \beta_{m\ell}^{\frac{\alpha_m}{1-\alpha_m}} \left( 1 - \omega_{m\ell} \right) - \alpha \left( 1 - \left( \omega_{h\ell} + \omega_{m\ell} \right) \right) \right] \left( c_{h\ell}^{-\alpha_h} c_{m\ell}^{-\alpha_m} \right)^{\frac{1}{1-\alpha}} 2AEQ_N^{\frac{1}{1-\alpha}}.
\]

Notice that, if \( \beta_{h\ell} \) (resp. \( \beta_{m\ell} \) is low enough, \( \pi^DH_{H\ell} \) (resp. \( \pi^DM_{M\ell} \)) may become negative. To exclude this uninteresting case of absent deviation incentives, I impose

**Assumption 1.** \( \left( \frac{\alpha(1-\omega_{hd} - \omega_{md})}{1-\alpha_{hd}} \right)^{\frac{1}{1-\alpha_{hd}}} \beta_{h\ell} < 1 - \left( \frac{\alpha(1-\omega_{hd} - \omega_{md})}{1-\alpha_{md}} \right)^{\frac{1}{1-\alpha_{md}}} \).

While either party’s deviation profits may be generally both positive and negative, I show

\[11\] The latter finding results from the complementarity of investments and the fact that cooperating party \( J \) invests under relational agreement more than under spot contracting, i.e. \( x^R_{j\ell} > x^S_{j\ell} \).

\[12\] This assumption, however, is not decisive for any of the derived results except Proposition 6.
that joint deviation incentives, \( \pi^D \equiv \pi^DH_{\ell \ell} + \pi^DM_{\ell \ell} \) are always positive and are larger than joint profits in the relational game:

**Lemma 3.** It holds \( \pi^D > \pi^R > 0 \) for all \( \alpha, \eta, \beta_j \in (0, 1), j = h, m. \)

**Proof.** See Appendix C.

Notice that \( \pi^DH_{\ell \ell}, \pi^DM_{\ell \ell}, \) and \( \pi^D \) depend via \( \omega_{ji} \) on the fraction of contractible activities, \( \mu_{ji}. \) The following Lemma establishes these relationships:

**Lemma 4.** It holds (i) \( \frac{\partial \pi^D}{\partial \mu_{ji}} < 0; \) (ii) \( \frac{\partial \pi^DH_{\ell \ell}}{\partial \mu_{m\ell}} < 0 \) and \( \frac{\partial \pi^DM_{\ell \ell}}{\partial \mu_{h\ell}} < 0; \) (iii) the sign of \( \frac{\partial \pi^DH_{\ell \ell}}{\partial \mu_{h\ell}} \) (resp. \( \frac{\partial \pi^DM_{\ell \ell}}{\partial \mu_{m\ell}} \)) is ambiguous and is more likely to be negative the lower \( \mu_{h\ell} \) (resp. \( \mu_{m\ell} \)) and the higher \( \eta_h \) (resp. \( \eta_m \)); (iv) \( \frac{\partial \pi^DM_{\ell \ell}}{\partial \mu_{m\ell}} > 0 \) if and only if \( \beta_{m\ell}^{1-\alpha_{m\ell}} \left(1 - \frac{\ln \delta_{m\ell}}{1 - \alpha_{m\ell}}\right) > 1. \)

**Proof.** See Appendix D.

Part (i) of Lemma 4 establishes an intuitive result that joint deviation incentives decline with higher fraction of either party’s contractible activities. Part (ii) argues that either party’s deviation incentives decrease in the fraction of her \textit{counterpart’s} contractible activities. To see that, consider again exemplary an increase in \( \mu_{h\ell}. \) Recall that \( \pi^DM_{\ell \ell} \) is constructed under assumption that \( H \) sticks to the implicit contract (i.e., does not underinvest with regard to non-contractible activities). Hence, an increase in \( \mu_{h\ell} \) does not change \( H \)'s ex ante investment incentives. Yet, higher \( \mu_{h\ell} \) reduces the negotiable bargaining chip in case of \( M \)'s deviation, thereby decreasing \( \pi^DM_{\ell \ell}. \) Part (iii) implies that party’s profits are ambiguously affected by the increase in the contractibility of \textit{her own} activities. This results from the interplay of two opposing effects. On the one hand, an increase in \( \mu_{h\ell} \) shifts the balance of \( H \)'s activities from suboptimally provided non-verifiable ones towards efficiently supplied contractible activities. The associated revenue increase (cf. equation (10)) positively affects \( \pi^DH_{\ell \ell}. \) On the other hand, however, \( H \)'s ability to renege on implicit agreement and, thereby, her deviation profits decrease. Part (iv) of Lemma provides a necessary condition for \( \frac{\partial \pi^DM_{\ell \ell}}{\partial \mu_{m\ell}} > 0 \) to hold.

To sum up, section 3 lays down the investment decisions and profits for a \textit{single} product cycle \( t = 0 \) under spot and relational (both on cooperation and deviation path) contracting. The next section embeds this one-shot game into a repeated game environment.

### 4 Repeated game

**Discount factor.** I assume that players discount future profits and employ three specific assumptions in this regard. First, I follow the majority of contributions on the repeated games by assuming that cooperation parties share a \textit{common} discount factor \( \delta_{\ell} \equiv 1/(1 + r_{\ell}), \)
Parameter $r_\ell$ represents joint per-period discount rate, if $M$ is located in $\ell = N, S$. The assumption of common discount factors, as restrictive as it is, can be justified by interpreting $\delta_\ell$ as the probability of continuation of a particular relationship, conditional on time $t$ being reached. To give economic interpretation of this technical concept, a higher discount factor $\delta_\ell$ (lower discount rate $r_\ell$) is commonly associated with higher bilateral trust.  

I adopt this interpretation in what follows and will use the terms (higher) trust and (lower) discount rates interchangeably. Second, I assume for simplicity that all pairs of $H$ and $M$ producing in country $\ell$ share the same discount factor. In this context, the common discount factor can be interpreted as a generalized level of trust, i.e., the trust towards a random counterpart. Third, I assume that headquarters generally trust their fellow countrymen in $M$ firms more than foreign suppliers, i.e., $r_N < r_S$.  

**Trigger strategies.** As specified above, if either party deviates from the implicit agreement, the relational contract is broken. I assume that the party who did not renege refuses to enter into a new relational contract with the opportunistic party. Furthermore, I assume that neither of the existing partners can enter into a new relational agreement with some third party. Therefore, in case of a failure of a relational agreement in period $t = 0$ the two parties live forever (i.e. in $t = 1, ..., \infty$) under spot governance (cf. section 3.1). Table 2 illustrates both parties’ profits on the cooperation and deviation path of a relational game.  

**Incentive compatibility constraints.** A headquarter (resp., supplier) will honor rather than renege on the implicit contract if $\pi_{R_H\ell} + \frac{\pi_{R_H\ell}}{r_\ell} \geq \pi_{DH_H\ell} + \frac{\pi_{DH_H\ell}}{r_\ell}$, resp., $\pi_{R_M\ell} + \frac{\pi_{R_M\ell}}{r_\ell} \geq \pi_{DM_M\ell} + \frac{\pi_{DM_M\ell}}{r_\ell}$. Rearranging these inequalities yields both firms’ incentive compatibility constraints:  

$$ICC_H : \left( \frac{\pi_{R_H\ell} - \pi_{S_H\ell}}{r_\ell} \right) \geq \pi_{DH_H\ell} - \pi_{R_H\ell} ; \quad ICC_M : \left( \frac{\pi_{R_M\ell} - \pi_{S_M\ell}}{r_\ell} \right) \geq \pi_{DM_M\ell} - \pi_{R_M\ell},$$  

where $\pi_{HJ\ell}$, $\pi_{RJ\ell}$ and $\pi_{DJ\ell}$ are given by (7), (9) and (11), respectively. Intuitively, the left-hand side of $ICC_J$ represents firm $J$’s present value from continuing a relational cooperation, while the right-hand side denotes this party’s reneging temptation. The relational contract

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13 See Mailath and Samuelson (2006) for an overview of this literature strand and Lehrer and Pauzner (1999) for discussion of limitations of this approach.  
14 See, for instance, James Jr. (2002), Kvaloy and Olson (2009) and MacLeod (2007) for this interpretation.  
15 Generalized trust is commonly proxied in empirical literature by the well-known World Values Survey Question: “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” This concept of trust is different from the personalized trust, i.e., the trust towards a particular counterpart (cf. Kukharskyy and Pfüger (2010) for the latter interpretation).  
16 Guiso et al. (2009) provide supportive evidence for this ‘home-country bias’.  
17 This can be motivated by the assumption that all existing cooperations are registered in a Commercial Registry, which is common knowledge for all market participants. However, neither the terms of the relational contract nor the identity of the reneging party can be detected by a third person. By assuming that a party who was cheated upon in the relational contract cannot credibly signalize her cooperative behavior to third parties, no third party will have an incentive to enter into a new relational agreement with a party who just contracted out.
is self-enforcing if each party’s one-shot gain from opportunistic behavior is outweighed by the loss of trust in the future. It can be easily verified that both incentive compatibility constraints are simultaneously fulfilled if the following (combined) ICC holds:

\[ ICC : \frac{(\pi^R - \pi^S)}{r_t} \geq \pi^D - \pi^R \Leftrightarrow B_t \geq \frac{\pi^S_m + r_t \pi^D_M}{1 + r_t} + C^R_{Mt}. \] (12)

As long as this ICC holds, there exists a bonus \( B_t \) which induces the first-best level of both parties’ activities in perpetuity. The headquarter will have an incentive to stipulate implicitly the smallest possible bonus, which still fulfills the ICC. The equilibrium bonus is thus given by \( B_t = \frac{\pi^S_m + r_t \pi^D_M}{1 + r_t} + C^R_{Mt} \).

<table>
<thead>
<tr>
<th>( J )</th>
<th>Decision</th>
<th>( t = 0 )</th>
<th>( t = 1 )</th>
<th>( \ldots )</th>
<th>( \infty )</th>
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</thead>
<tbody>
<tr>
<td>H</td>
<td>Comply</td>
<td>( \pi^R_{Ht}(x^c_{ht}, x^c_{mt}, x^R_{ht}, x^R_{mt}) )</td>
<td>( \frac{\pi^R_{Ht}}{1 + r_t} )</td>
<td>( \pi^R_{Ht} + \sum_{t=1}^{\infty} \left( \frac{1}{1 + r_t} \right) t \pi^R_{Ht} = \pi^R_{Ht} + \frac{\pi^R_{Ht}}{r_t} )</td>
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<tr>
<td></td>
<td>Defect</td>
<td>( \pi^D_{Ht}(x^c_{ht}, x^c_{mt}, x^D_{ht}, x^R_{mt}) )</td>
<td>( \frac{\pi^S_{Ht}}{1 + r_t} )</td>
<td>( \pi^D_{Ht} + \sum_{t=1}^{\infty} \left( \frac{1}{1 + r_t} \right) t \pi^S_{Ht} = \pi^D_{Ht} + \frac{\pi^S_{Ht}}{r_t} )</td>
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</tr>
<tr>
<td>M</td>
<td>Comply</td>
<td>( \pi^R_{Mt}(x^c_{ht}, x^c_{mt}, x^R_{ht}, x^R_{mt}) )</td>
<td>( \frac{\pi^R_{Mt}}{1 + r_t} )</td>
<td>( \pi^R_{Mt} + \sum_{t=1}^{\infty} \left( \frac{1}{1 + r_t} \right) t \pi^R_{Mt} = \pi^R_{Mt} + \frac{\pi^R_{Mt}}{r_t} )</td>
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<td>Defect</td>
<td>( \pi^D_{Mt}(x^c_{ht}, x^c_{mt}, x^D_{ht}, x^D_{mt}) )</td>
<td>( \frac{\pi^S_{Mt}}{1 + r_t} )</td>
<td>( \pi^D_{Mt} + \sum_{t=1}^{\infty} \left( \frac{1}{1 + r_t} \right) t \pi^S_{Mt} = \pi^D_{Mt} + \frac{\pi^S_{Mt}}{r_t} )</td>
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Table 2: Trigger strategy in the repeated game.

Using Lemmas 2 and 3, it immediately follows that both sides of the ICC are positive for all parameter values. Hence, the ICC can be rearranged as:

\[ \bar{r}_t \equiv \frac{\pi^R_e - \pi^S_e}{\pi^D_e - \pi^R_e} = \frac{(1 - \alpha) - \beta_{ht}^{\omega_{ht}} \beta_{mt}^{\omega_{mt}} (1 - \alpha[1 - \beta_{ht}\omega_{ht} - \beta_{mt}\omega_{mt}])}{\beta_{ht}^{1 - \omega_{ht}} (1 - \alpha\omega_{ht}) + \beta_{mt}^{1 - \omega_{mt}} (1 - \alpha\omega_{mt}) + \alpha(\omega_{ht} + \omega_{mt}) - 1}, \] (13)

where \( \bar{r}_t \) denotes the cutoff rate of time preference which satisfies the ICC with equality.

If \( r_t < \bar{r}_t \), cooperation parties can achieve the first-best outcome by means of relational contracting. Otherwise, the parties negotiate in each period on the spot.

Notice that the degree of contractibility of either party’s activities, affects the cutoff time preference rate via two channels: \( \pi^D_e(\mu_{jt}) \) and \( \pi^S_e(\mu_{jt}) \). Recall from Lemma 4 that joint deviation profits \( \pi^D_e \) decrease in \( \mu_{jt} \). The associated increase in \( \bar{r}_t \) implies ceteris paribus that implicit agreements are now sustainable for a larger range of \( r_t \). Intuitively, higher contractibility of either party’s investment reduces the immediate gains from behaving
opportunistically and, thus, makes implicit contracts relatively more attractive. At the same time, however, higher $\mu_{j\ell}$ leads to a larger $\pi_S$, thereby decreasing $\bar{r}_\ell$. Intuitively, higher contractibility decreases future “punishment” in case of the break-down of the relational agreement, thus making implicit contracts relatively less attractive. Since the reaction of $\bar{r}_\ell$ on the increase of the contractibility of activities is ambiguous, I conclude:

**Proposition 1. Interaction of explicit and implicit contracts:** The increase in contractibility of either party’s activities, $\mu_{j\ell}$ may deteriorate agents’ ability to enter relational agreements.

*Proof.* Follows immediately from utilizing Lemma 1 and 4 in equation (13).

By analyzing equation (13) numerically, I observe for a widest range of parameter values an inverted U relationship between $\mu_{j\ell}$ and $\bar{r}_\ell$. That is, a country with less developed formal contractual institutions first experiences a rise in relational contracting due to better contractual verifiability. Further improvement of formal institutions, however, may after a certain threshold crowd out implicit enforcement mechanisms. The following figure illustrates this pattern for a given set of parameter values:

![Figure 2](image)

*Figure 2:* $\bar{r}_\ell$ from (13) for $\alpha = 0.8$, $\beta_{h\ell} = 1/2$, $\mu_{h\ell} = \mu_{m\ell} = \mu_{\ell} \in (0, 1)$, $\eta_h \in (0, 1)$.

**Participation constraints.** Manufacturing suppliers are willing to participate in relational contracting as long as $\pi_{RM\ell} \geq 0$. Utilizing equilibrium bonus $B_{\ell} = \frac{\pi_{SM\ell} + r_{\ell} \pi_{DM\ell}}{1 + r_{\ell}} + C_{RM\ell}$ in equation (9) yields $\pi_{RM\ell} = \frac{\pi_{SM\ell} + r_{\ell} \pi_{DM\ell}}{1 + r_{\ell}}$. The latter expression is always positive, since $\pi_{SM\ell}$ from (7) is above zero for all parameter values and $\pi_{DM\ell} > 0$ holds under Assumption 1. Consider next $H$’s participation constraint. Recall that $ICC$ implies $\pi_{R_{H\ell}} + \frac{\pi_{R_{H\ell}}}{r_{\ell}} \geq \pi_{DH_{H\ell}} + \frac{\pi_{S_{H\ell}}}{r_{\ell}}$. The headquarter is willing to participate in relational contracting instead of negotiating on the spot, if and only if $\pi_{R_{H\ell}} + \frac{\pi_{R_{H\ell}}}{r_{\ell}} \geq \pi_{S_{H\ell}} + \frac{\pi_{S_{H\ell}}}{r_{\ell}}$. It immediately follows that $ICC$ simultaneously

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The inverted U relationship turns into a positive monotone relationship between $\mu_{j\ell}$ and $\bar{r}_\ell$ only for combinations of extreme values of $\alpha$, $\beta_{h\ell}$, and $\eta_h$. 

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![Figure 2](image)
fulfills $H$’s participation constraint, if and only if $\pi^H_{\pi_t} \leq \pi^{DH}_{\pi_t}$. In the following, I assume that this condition is always fulfilled and concentrate solely on ICC.

5 Choice of location and industry equilibrium

Denote by $V^G_{\pi_t} \equiv \sum_{t=0}^{\infty} \left(\frac{1}{1+r_t}\right)^t \pi^G_{\pi_t} = \frac{(1+r_t)}{r_t} \pi^G_{\pi_t}$ the present value of $H$’s profit flow under governance mode $G \in \{S, R\}$ if manufacturing supplier is located in $\ell$. Utilizing $B_t$ from (12) in (9) yields the present value of headquarters’ profit flow under relational contracting:

$$ V^R_{\pi_t} = \left(\frac{1+r_t}{r_t}\right)^{\alpha} 2AEQ^{1-\alpha} \left[1 + \frac{\partial V^R_{\pi_t}}{\partial r_t} (1 - \alpha) \right] $$

It is readily verified that $\frac{\partial V^R_{\pi_t}}{\partial r_t} < 0$, if and only if $\frac{\partial V^R_{\pi_t}}{\partial r_t} < 0$, which indeed holds true due to Lemma 2. Intuitively, higher generalized level of trust in country $\ell$ (i.e., lower $r_\ell$) implies higher present value of headquarters’ profits under relational contracting.

Similarly, the present value of headquarters’ profits under spot contracting is given by

$$ V^S_{\pi_t} = \left(\frac{1+r_t}{r_t}\right)^{\alpha} 2AEQ^{1-\alpha} \left[1 + \frac{\partial V^S_{\pi_t}}{\partial r_t} (1 - \alpha) \right] $$

Since $\frac{\partial V^S_{\pi_t}}{\partial r_t} < 0$, $V^S_{\pi_t}$ is as well increasing in country $\ell$’s trust level (i.e., is decreasing in $r_\ell$).

Using $V^R_{\pi_t}$ and $V^S_{\pi_t}$ and bearing in mind that $c_{hN} = c_{hS} = c_{mN} = w_N$ and $c_{mS} = \tau w_S$, the relative attractiveness of $N$ as location for manufacturing production is given by

$$ V(w_N, \tau w_S, r_N, r_S, \mu_{mS}, \cdot) \equiv \frac{V^G_{\pi_t}}{V^S_{\pi_t}} = \left(\frac{w_N}{\tau w_S}\right)^{\alpha m} \frac{\Gamma^G_{\pi} (r_N, \cdot)}{\Gamma^S_{\pi} (r_S, \mu_{mS}, \cdot)} $$

where $G^* \in \{S, R\}$ denotes the optimal governance mode from the viewpoint of headquarters. $H$ (weakly) prefers cooperation with a northern rather than a southern supplier iff $V \geq 1$.

Notice from (14) that $V$ is decreasing in the N’s relative cost disadvantage, $\frac{w_N}{\tau w_S}$ and increasing in the N’s relative advantage in terms of the trust level, $\frac{r_N}{r_S}$. I thus maintain:

**Proposition 2.** Impact of trust level and production cost on the offshoring decision: Manufacturing production is more likely to be offshored from $N$ to $S$ the higher is $S$’s relative cost advantage and the lower is $S$’s relative trust disadvantage.

**Proof.** Follows immediately from inspection of equation (14).

Appendix F provides a numerical example to illustrate $H$’s choice of $G \in \{S, R\}$ in $\ell \in \{N, S\}$. 

18
Notice that \( V \) from (14) depends among other things on the fraction of contractible activities in the South, \( \mu_{mS} \). Consider the impact of the change of this fraction on the offshoring decision. I analyze this impact for any given \( \bar{V}_{HN}^G \) (i.e. any given optimal governance mode in \( N \)) and two possible offshoring modes, \( \bar{V}_{HS}^G \in \{ \bar{V}_{HS}^S, \bar{V}_{HS}^R \} \). Assume first that offshoring to the South under relational contracting is not possible, i.e. \( \bar{V}_{HS}^G = \bar{V}_{HS}^S \). Recall from part (iv) of Lemma 1, that if \( M \)'s share of revenue is high enough, \( H \)'s per-period profits are decreasing in \( \mu_{mS} \). Since the present value of \( H \)'s profits is a positive monotonic function of \( \pi_{HS}^S \), \( \bar{V}_{HS}^S \) is decreasing in \( \mu_{mS} \) if \( \beta_{mS} > e^{-\frac{1}{\alpha(1-\omega_{mS})}} \).

Assume next that relational contracting in the South is self-enforcing, i.e. \( \bar{V}_{HS}^G = \bar{V}_{HS}^R \). \( \bar{V}_{HS}^R \) depends on the fraction of \( M \)'s contractible activities via two channels: \( \pi_{MS}^S(\mu_{mS}) \) and \( \pi_{MS}^{DM}(\mu_{mS}) \). Recall from part (ii) of Lemma 1 and part (iv) of Lemma 4 that \( \pi_{MS}^S \) is always increasing in \( \mu_{mS} \), whereas \( \pi_{MS}^{DM} \) is increasing in \( \mu_{mS} \) iff \( \beta_{mS} > \frac{1}{\alpha(1-\omega_{mS})} > 1 \). Under the latter condition, \( \bar{V}_{HS}^R \) is decreasing and, therefore, \( V \) from (14) is increasing in \( \mu_{mS} \). Intuitively, an increase of \( M \)'s deviation profits in the South diminishes the relative attractiveness of \( S \) from the viewpoint of \( H \) since she now needs to compensate a southern supplier with a larger bonus \( B_S \) in order to restore the incentive compatibility of the latter.

In the following Lemma, I derive a sufficient condition for \( \beta_{mS} > \frac{1}{\alpha(1-\omega_{mS})} \) to be simultaneously fulfilled:

**Lemma 5.** \( \beta_{mS} > \frac{1}{\alpha(1-\omega_{mS})} \) holds \( \forall \beta_{mS} > e^{-\frac{1}{\alpha(1-\omega_{mS})}} \) iff \( \omega_{mS} = \frac{\eta_m}{1-\mu_{mS}} < \frac{3}{4} \).

**Proof.** See Appendix E.

**Proposition 3. Contractibility of southern manufacturing activities and the offshoring decision:** An increase in the contractibility of southern manufacturing activities has an ambiguous impact on the relative attractiveness of offshoring as compared to home sourcing. Under certain conditions (cf. Lemma 5), the relative attractiveness of offshoring decreases in the share of southern contractible activities.

**Proof.** Follows immediately from Lemma 5 and discussion above.

Given the optimal choice of \( G \) in country \( \ell \), skilled workers will found new firms as long as the present value of the profit flow overcompensates the present value of their opportunity cost. If the mass of skilled workers is high enough, free entry ensures that these net present values equalize. The industry equilibrium is thus fully described by:

\[
\bar{V}_{H\ell}(Q_N) = \frac{(1 + r_\ell)}{r_\ell} w_N. \tag{15}
\]
6 Extensions

6.1 The Make-or-buy decision

Suppose that, in addition to the decision about the location $\ell \in \{N, S\}$ and the governance mode $G \in \{R, S\}$, the headquarter decides whether to integrate ($I$) a supplier or to outsource ($O$) the manufacturing production to an independent $M$. The chosen organizational form $F \in \{I, O\}$ is stipulated explicitly and enforceable by the courts. For simplicity, I assume that this organizational form prevails in all future periods of the game (even if the relational agreement breaks down). Figure 3 summarizes the extended timing, whereby the game under either organizational form is identical to the one specified in Figure 1.

![Figure 3: Extended timing.](image)

Following the Property Rights Theory of the firm by Grossman and Hart (1986) and Hart and Moore (1990), I assume that ex post bargaining about the reward of non-contractible investments takes place both under integration and outsourcing. However, the distribution of surplus is sensitive to the organizational form. I, thereby, follow Antràs (2003) and Antràs and Helpman (2004, 2008) by assuming that the headquarter will obtain a greater share of surplus under vertical integration than under outsourcing:

**Assumption 2.** $\beta_{hi}^I > \beta_{hi}^O$.

Given that, apart from the choice of the organizational form, the timing of Figures 3 is identical, all results from sections still hold except that $\beta_{j\ell}$ has to be substituted by the organization-specific $\beta_{j\ell F} \in \{\beta_{j\ell I}, \beta_{j\ell O}\}$.

**Spot contracting.** Consider first the organizational choice of a headquarter who decides in favor of spot cooperation with a supplier in country $\ell$ (see upper path in fig. 3). Using (7), denote the ratio of $H$’s profits under spot integration to those under spot outsourcing as:

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19. However, the case in which headquarters can choose anew the ownership form on the deviation path can be easily incorporated into the present model.

20. The intuition behind this assumption lies in the reasoning that under integration the headquarter possesses property right for supplier’s assets and therefore has a greater outside option if the current cooperation breaks down. Hence, by integrating a supplier a headquarter improves her ex post bargaining position and raises thereby her revenue share as compared to the case of outsourcing.
The headquarter strictly prefers integration over outsourcing, if and only if $\Theta_{Ht}^S > 1$. The following proposition establishes the impact of $\eta_h$, $\mu_{ht}$, and $\mu_{ml}$ on $\Theta_{Ht}^S$:21

**Proposition 4. Organizational choice under spot contracting:** Under Assumption 2, the relative attractiveness of spot integration as compared to spot outsourcing is (i) increasing in the headquarter intensity $\eta_h$, (ii) increasing in the fraction of $M$’s contractible activities $\mu_{ml}$, (iii) decreasing in the fraction of $H$’s contractible activities $\mu_{ht}$.

**Proof.** See Appendix G.

To infer the intuition behind this proposition, notice from (16) that the ratio of $H$’s profits is a constant fraction of the ratio of joint revenues, $\frac{R_{HI}^S}{R_{HO}^S}$. Hence, in order to maximizes her own profits the headquarter has to choose the organizational form that maximizes joint revenue. Recall that higher $\eta_h$ represents lower weight of supplier’s activities in the production process. Since the need to incentivize supplier’s activities through an outsourcing of production process decreases, the relative attractiveness of spot integration increases. In the same vein, an increase in $\mu_{ml}$ (and/or decrease in $\mu_{ht}$) makes $M$ less prone to be held up ex post by the $H$, thereby decreasing the need for incentivizing $M$ via spot outsourcing.

**Relational contracting.** Assume next that a headquarter decides in favor of relational contracting with a manufacturing producer in $\ell$ (see lower path in fig. 3). The headquarter strictly prefers relational integration over relational outsourcing if $\pi_{RHI}^S > \pi_{RHO}^S$. By utilizing equilibrium bonus from (12) in (9), this condition reads $\pi_R^R - \frac{\pi_{SMLI}^S}{1+r_\ell} > \pi_{R}^R - \frac{\pi_{SMLIO}^S}{1+r_\ell}$.

It follows immediately that integration is strictly preferred over outsourcing if and only if

$$\Theta_{M\ell}^R \equiv \frac{\pi_{DMIO}^S + \pi_{SMLIO}^S r_\ell}{\pi_{DMHI}^S + \pi_{SMLHI}^S r_\ell}$$

is greater than one. Intuitively, the higher are $\pi_{SMLIO}^S$ and $\pi_{DMIO}^S$ compared to $\pi_{SMLHI}^S$ and $\pi_{DMHI}^S$, the larger are $M$’s profits on the deviation path under relational outsourcing compared to those under relational integration (see table 2). Since under relational contracting $M$ has to be remunerated with a bonus which (weakly) overcompensates her profits on the deviation path, $H$ chooses an organizational form under which the bonus is lowest.

Notice that the reaction of $\Theta_{M\ell}^R(\cdot)$ on the change of $\eta_h$, $\mu_{H\ell}$ and $\mu_{ml}$ cannot be calculated.

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21 Even though Proposition 4 resembles Propositions 2 and 3 from Antràs and Helpman (2008), it might be considered as complementary since it has been established without relying on the simplifying assumption of ex ante transfers between parties.
explicitly, since this is a recursive problem. To see this define the set \( \Lambda = \{\eta_h, \mu_{m\ell}, \mu_{h\ell}\} \), with \( \lambda \) being its element. Using this definition, the optimization problem can be expressed as
\[
\frac{\partial \Theta_R^{M\ell}(\Lambda, \alpha, \beta_{h\ell}I, \beta_{m\ell}O, r_{\ell} < \min\{\bar{r}_{\ell I}(\Lambda, \alpha, \beta_{h\ell}I), \bar{r}_{\ell O}(\Lambda, \alpha, \beta_{m\ell}O)\})}{\partial \lambda}.
\]
Notice that \( \Theta_R^{M\ell}(\cdot) \) depends among other things on \( r_{\ell} \), whose upper bound \( \bar{r}_{\ell F}(\cdot) \) from (13) is itself a function of \( \lambda \in \Lambda \). We thus need to resort to numerical computations in order to get any insights in this issue. By conducting numerical simulations for a wide range of parameter values and bearing in mind Assumption 1 (in order to exclude the case \( \Theta_R^{M\ell}(\cdot) < 0 \)), I could not refute the following pattern:

**Result 5. Organizational choice under relational contracting:** Under Assumptions 1 and 2, the relative attractiveness of relational integration as compared to relational outsourcing is

(i) decreasing in the headquarter intensity \( \eta_h \),

(ii) decreasing in the fraction of \( M 's contractible activities \( \mu_{m\ell} \),

(iii) increasing in the fraction of \( H 's contractible activities \( \mu_{h\ell} \).

Result 5 suggests that parameters \( \eta_h, \mu_{m\ell} \) and \( \mu_{h\ell} \) affect the make-or-buy decision under relational contracting in a diametrically opposed manner as compared to spot contracting (cf. Proposition 4). In order to infer the intuition behind this result, consider separately the ratio of \( M 's profits under spot integration to those under spot outsourcing:
\[
\Theta_S^{M\ell} \equiv \frac{\pi_{MII}^S}{\pi_{MIO}^S} = \frac{\beta_{m\ell I} R_{II}^S}{\beta_{m\ell O} R_{IO}^S} = \frac{\beta_{m\ell I} (\beta_{h\ell I}^{1-\alpha} \beta_{m\ell I}^{1-\alpha})^{\frac{1}{1-\alpha}}}{\beta_{m\ell O} (\beta_{h\ell O}^{1-\alpha} \beta_{m\ell O}^{1-\alpha})^{\frac{1}{1-\alpha}}}
\]
(18)
and the ratio of \( M 's one-shot deviation profits under integration vs. outsourcing :
\[
\Theta_{DM}^{M\ell} \equiv \frac{\pi_{MII}^{DM}}{\pi_{MIO}^{DM}} = \frac{\beta_{m\ell I} [\beta_{m\ell I}^{1-\alpha} (1 - \alpha \omega_{m\ell}) - \alpha (1 - \omega_{h\ell} + \omega_{m\ell})]}{\beta_{m\ell O} [\beta_{m\ell O}^{1-\alpha} (1 - \alpha \omega_{m\ell}) - \alpha (1 - \omega_{h\ell} + \omega_{m\ell})]}
\]

Notice that \( \Theta_S^{M\ell} \) is a constant fraction of the ratio of joint revenues, \( R_{II}^S / R_{IO}^S \). The reaction of this ratio due to the change of \( \eta_h, \mu_{m\ell}, \) and \( \mu_{h\ell} \) has been already established in Proposition 4. Yet, the logic behind the choice of organizational form in this case is diametrically opposed. In Proposition 4 the headquarter intended to choose the organizational form which maximizes joint revenue and, thereby, her own profits. In this case, however, she aims at minimizing joint revenue on the deviation path, thereby reducing \( M 's incentives to renege on the implicit agreement.

With regard to \( \Theta_{DM}^{M\ell} \), only the impact of \( \mu_{h\ell} \) can be established without ambiguity: \( \Theta_{DM}^{M\ell}(\mu_{h\ell}) < 0 \). Intuitively, since \( \beta_{m\ell O} > \beta_{m\ell I} \), the decrease of \( M 's one-shot deviation profits due to the increase in the contractibility of \( H 's activities (cf. part (ii) of Lemma
4) is less pronounced under relational outsourcing than under relational integration. This effect reinforces the impact of $\mu_h \ell$ on $\Theta_S^M$, that is, the relative attractiveness of relational integration increases with higher $\mu_h \ell$. Yet, the reaction of $\Theta^D_M$ with respect to $\eta_h$ and $\mu_m \ell$ cannot be established without ambiguity. However, the Result 5 suggests that, independently of the reaction of $\Theta^D_M$ on $\eta_h$ and $\mu_m \ell$, the effect of these variables on $\Theta_S^M$ will predominate the choice of organizational form under relational contracting.

6.2 Trust, contractibility, and the make-or-buy decision

While the level of $r_S$ has no impact on the make-or-buy decision under spot cooperation (cf. equation (16)), the choice of organizational form under relational contracting depends on $r_S$ (cf. equation (17)). Recall that the relative attractiveness of relational integration is increasing in $\Theta^R_M$. Bearing in mind that $r_\ell$ represents an inverse measure for the generalized level of trust, an increase in trust level decreases the relative attractiveness of relational integration, if and only if $\Theta^R_M$ is increasing in $r_\ell$. I maintain:

**Proposition 6. Interaction between level of trust, contractual institutions, and the make-or-buy decision:** The relative attractiveness of relational integration is more likely to decrease in country level of trust the lower $\mu_h \ell$ and the higher $\mu_m \ell$ and $\eta_h$.

**Proof.** See Appendix H.

To interpret this Proposition, recall that under relational contracting $H$ chooses the organizational form $F \in \{I, O\}$ which minimizes the sum of $M$’s one-shot deviation profits and the net present value of $M$’s profit flow under subsequent spot cooperation, $\pi^D_M + \pi^S_M / r_\ell$. Notice that the decrease in the discount rate increases the relative weight of the second term, shifting thereby $H$’s choice of organizational form towards the one which primarily minimizes $\pi^S_M$. It has been established in equation (18) and discussion below that $\pi^S_{MII}$ is more likely to be higher than $\pi^S_{MIO}$ the higher $\eta_h$ and $\mu_m \ell$ and the lower $\mu_h \ell$. Conversely, the relative attractiveness of relational integration from the viewpoint of $H$ decreases in country trust level of trust the lower $\mu_h \ell$ and the higher $\mu_m \ell$ and $\eta_h$.

7 Concluding Comments

This paper’s epigraphs convey a simple yet profound message: A widely accepted wisdom ‘institutions matter’ a priori implies nothing about the actual form the institutions should take. The aim of this theoretical paper is to contribute to the understanding of the interde-
pendence between various institutional forms as an explanatory factor of the international make-or-buy decision. I do so by introducing relational contracts into an otherwise standard model of North-South trade with partial contractibility. I show that formal and informal institutions may act both as complements and substitutes and discuss conditions under which explicit contracts may crowd out the implicit ones. I further argue that, while higher level of trust unambiguously increases country’s locational advantage, the impact of better contractibility on a country’s attractiveness as an offshoring destination is ambiguous. Clearly, the diverging impact of institutions on the global sourcing decision is ultimately an empirical question. This paper provides a number of hypothesis that may serve as a starting point for the empirical research.

An interesting research agenda would be to relax the assumption that country level of trust is constant over time. For instance, one could assume that the level of trust is positively affected by the development of the legal system (degree of contractibility). Such a model would entail a richer set of predictions concerning the interaction between formal and informal institutions. On the one hand, better formal institutions may destroy current trust-based relationships, as in the present model. On the other hand, however, they can contribute to the emergence of new relational contract in the future periods. The multi-period described in this paper can serve as a starting point to study the evolution of trust.
References


Appendices

A Proof of Lemma 1

Bearing in mind that $\omega_{j\ell} = \eta_j (1 - \mu_{j\ell})$, following results can be obtained from simple differentiation of equations in (7):

(i) Joint profits under spot contracting

$$\pi^S_\ell = \pi^S_{H\ell} + \pi^S_{M\ell} = \left[ \frac{\alpha_{H\ell} - \alpha_{M\ell}}{\beta_{H\ell} - \beta_{M\ell}} \right] (1 - \alpha (1 - \beta_{H\ell} \omega_{m\ell} - \beta_{m\ell} \omega_{h\ell})) \left( c_{h\ell}^{-\alpha_h} c_{m\ell}^{-\alpha_m} \right)^{\frac{1}{1-\alpha}} 2AEQ^N_{\frac{1}{1-\alpha}}$$

are increasing in $\mu_{j\ell}$:

$$\frac{\partial \pi^S_\ell}{\partial \mu_{j\ell}} = \left[ -\ln \beta_{j\ell} - \frac{\beta_{k\ell}}{1 - \alpha} \frac{\beta_{k\ell}}{1 - \alpha (1 - \beta_{H\ell} \omega_{m\ell} - \beta_{m\ell} \omega_{h\ell})} \right] \alpha \eta_j \pi^S_\ell > 0.$$ 

This results due to the fact that $-\ln \beta_{j\ell} > \beta_{k\ell}$ for all $\beta_{j\ell} \in (0,1)$, $\beta_{k\ell} = 1 - \beta_{j\ell}$, $j, k = h, m$, $j \neq k$ and $(1 - \alpha) < (1 - \alpha (1 - \beta_{H\ell} \omega_{m\ell} - \beta_{m\ell} \omega_{h\ell}))$ for all possible parameter values.

(ii) The reaction of party $H$'s profits on the increase in $\mu_{h\ell}$ is unambiguously positive:

$$\frac{\partial \pi^S_{H\ell}}{\partial \mu_{h\ell}} = -\frac{\ln(\beta_{h\ell}) \alpha \eta_h}{1 - \alpha} \pi^S_{H\ell} > 0.$$ 

By changing subscripts it is readily shown that $\frac{\partial \pi^S_{H\ell}}{\partial \mu_{m\ell}} > 0$.

(iii) The reaction of party $H$’s profits on the increase in $\mu_{m\ell}$:

$$\frac{\partial \pi^S_{H\ell}}{\partial \mu_{m\ell}} = \left[ -\ln(\beta_{m\ell}) \frac{1}{1 - \alpha} - \frac{1}{1 - \alpha (1 - \eta_m (1 - \mu_{m\ell}))} \right] \alpha \eta_m \pi^S_{H\ell}$$

is ambiguous since the terms in the squared brackets can be both positive and negative. Notice that $\frac{\partial \pi^S_{H\ell}}{\partial \mu_{m\ell}}$ is more likely to be positive the higher $\beta_{h\ell} = 1 - \beta_{m\ell}$, the lower $\mu_{m\ell}$ and the higher $\eta_m$. Similarly, the sign of $\frac{\partial \pi^S_{H\ell}}{\partial \mu_{h\ell}}$ cannot be assigned unambiguously and it is more likely to be positive the higher is $\beta_{m\ell}$, the lower $\mu_{h\ell}$ and the higher $\eta_h$.

(iv) It immediately follows from the transformation of the term in the squared brackets that $\frac{\partial \pi^S_{H\ell}}{\partial \mu_{m\ell}} < 0$ iff $\beta_{m\ell} > e^{-1 - \frac{\alpha}{1-\alpha (1-\omega_{m\ell})}}$, whereby $e^{-1 - \frac{\alpha}{1-\alpha (1-\omega_{m\ell})}} \in (0,1)$ for all $\alpha, \omega_{m\ell} \in (0,1)$.

B Proof of Lemma 2

Using (9), joint profits under relational contracting are given by

$$\pi^R_\ell = \pi^R_{H\ell} + \pi^R_{M\ell} = (1 - \alpha) \left( c_{h\ell}^{-\alpha_h} c_{m\ell}^{-\alpha_m} \right)^{\frac{1}{1-\alpha}} 2AEQ^N_{\frac{1}{1-\alpha}}.$$
Notice that these profits are independent from $\mu_{jt}$. By contrast, joint profits under spot contracting are increasing in $\mu_{jt}$, i.e. $\frac{\partial \pi^S}{\partial \mu_{ht}} > 0$ and $\frac{\partial \pi^R}{\partial \mu_{mt}} > 0$ (see Lemma 1). That is, if $\pi^R_1 > \pi^S_1$ holds for $\mu_{jt} = 1$, it holds a fortiori for all $\mu_{jt} \in [0, 1)$. Substituting $\mu_{ht} = \mu_{mt} = 1$ in $\pi^S_1$ and utilizing $\beta_{mt} = 1 - \beta_{ht}$ and $\eta_m = 1 - \eta_h$ therein yields the sufficient condition for $\pi^R_1 > \pi^S_1$ to hold: $(1 - \alpha) > \beta_{ht}^{\eta_h/h} (1 - \beta_{ht})^{\alpha(1 - \eta_h)/\alpha - 1} (1 - \alpha[\beta_{ht}\eta_h + (1 - \beta_{ht})(1 - \eta_h)])$. Rearrange this condition as

$$\psi_{ht}(\eta_h) \equiv \beta_{ht}^{\eta_h/h} (1 - \beta_{ht})^{\alpha(1 - \eta_h)/\alpha - 1} (1 - \alpha[\beta_{ht}\eta_h + (1 - \beta_{ht})(1 - \eta_h)]) + \alpha < 1.$$  

It follows from simple differentiation of this function with respect to $\eta_h$ that $\psi'(\eta_h) \geq 0$ iff

$$\gamma_{\ell}(\eta_h) \ln \left(\frac{1 - \beta_{ht}}{\beta_{ht}}\right) \leq (1 - \alpha)(1 - 2\beta_{ht}),$$  

where $\gamma_{\ell}(\eta_h) \equiv (1 - \alpha(\beta_{ht}\eta_h + (1 - \beta_{ht})(1 - \eta_h))) > 0$ for all $\alpha, \beta_{ht}, \eta_h \in (0, 1)$, and $\gamma'_{\ell}(\eta_h) \geq 0$ if $\beta_{ht} \leq 1/2$. The following properties result from the inspection of inequality (19): (i) If $\beta_{ht} < 1/2$, then $\psi'_{ht}(\eta_h) < 0$, $\forall \eta_h, \alpha \in [0, 1]$; (ii) if $\beta_{ht} > 1/2$, then $\psi'_{ht}(\eta_h) > 0$, $\forall \eta_h, \alpha \in [0, 1]$; (iii) if $\beta_{ht} = 1/2$, then $\psi'_{ht}(\eta_h) = 0$, $\forall \eta_h, \alpha \in [0, 1]$. Using these properties, the sufficient conditions for $\psi_{ht}(\eta_h) < 1$ to hold simplify to $\psi_{ht}(0) < 1$ for $\beta_{ht} \in (0, 1/2)$; $\psi_{ht}(1) < 1$ for $\beta_{ht} \in (1/2, 1)$, and $\psi_{ht}(\eta_h) < 1$ for $\beta_{ht} = 1/2$. It can be easily verified that these conditions hold for all $\alpha, \beta_{ht}, \eta_h \in (0, 1)$. This implies $\psi_{ht} < 1$ and completes the proof of Lemma 2.

### C Proof of Lemma 3

Since $\pi^R_1 > 0$ for all parameter values, Lemma 3 holds if and only if

$$\Omega(\alpha) \equiv \beta_{ht}^{1 - \alpha\omega_{ht}} (1 - \alpha\omega_{ht}) + \beta_{mt}^{1 - \alpha\omega_{mt}} (1 - \alpha\omega_{mt}) + \alpha(\omega_{ht} + \omega_{mt}) - 1 > 0.$$  

It immediately follows for the corner solution, that $\Omega(0) = 0$. Taking the first order derivative of $\Omega(\alpha)$ with respect to $\alpha$ yields:

$$\frac{\partial \Omega}{\partial \alpha} = \omega_{ht} \left(1 + \beta_{ht}^{1 - \alpha\omega_{ht}} \left(\frac{\ln \beta_{ht}}{1 - \alpha\omega_{ht}} - 1\right)\right) + \omega_{mt} \left(1 + \beta_{mt}^{1 - \alpha\omega_{mt}} \left(\frac{\ln \beta_{mt}}{1 - \alpha\omega_{mt}} - 1\right)\right)$$

Moreover, $\frac{\partial^2 \Omega}{\partial \alpha^2} = \beta_{ht}^{1 - \alpha\omega_{ht}} \omega_{ht}^2 \left(\frac{\ln \beta_{ht}}{1 - \alpha\omega_{ht}}\right)^2 + \beta_{mt}^{1 - \alpha\omega_{mt}} \omega_{mt}^2 \left(\frac{\ln \beta_{mt}}{1 - \alpha\omega_{mt}}\right)^2 > 0$ implies $\frac{\partial \Omega}{\partial \alpha}{\bigg|}_{\alpha=0} < \frac{\partial \Omega}{\partial \alpha}{\bigg|}_{\alpha=1}$. Hence, the sufficient condition for $\frac{\partial \Omega}{\partial \alpha} > 0$ to hold is $\frac{\partial \Omega}{\partial \alpha}{\bigg|}_{\alpha=0} > 0$. It can be easily verified that the latter holds for all possible parameter values. Since $\Omega(0) = 0$ and $\Omega'(\alpha) > 0$, it holds $\Omega(\alpha) > 0$ for all $\alpha, \eta_h, \beta_{jt} \in (0, 1)$. This completes the proof of Lemma 3.
D Proof of Lemma 4

(i) Joint deviation profits, $\pi^D_\ell \equiv \pi^DH_\ell + \pi^DM_\ell$ are given by

$$\pi^D_\ell = \left[ \beta_\ell \frac{1}{\omega_\ell}(1 - \alpha) + \beta_\ell \frac{1}{\omega_\ell}(1 - \alpha \omega_m) - \alpha(1 - (\omega_\ell + \omega_m)) \right] \left( e^{\alpha \eta_h} e^{-\alpha \eta_m} \right)^{\frac{1}{1 - \alpha}} 2AEQ_N^{\frac{1}{1 - \alpha}}$$

and are decreasing in $\mu_{j_\ell}$

$$\frac{\partial \pi^D_\ell}{\partial \mu_{j_\ell}} = -\alpha \eta_h \left( \frac{\beta_\ell}{1 - \alpha \omega_{j_\ell}} \ln \beta_{j_\ell} - \frac{1}{\beta_{j_\ell}} + 1 \right) \left( e^{\alpha \eta_h} e^{-\alpha \eta_m} \right)^{\frac{1}{1 - \alpha}} 2AEQ_N^{\frac{1}{1 - \alpha}} < 0,$$

if and only if

$$LHS(\alpha) \equiv \beta_\ell \frac{1}{\omega_{j_\ell}} \left( 1 - \frac{\ln \beta_{j_\ell}}{1 - \alpha \omega_{j_\ell}} \right) < 1.$$ 

Differentiating $LHS$ with respect to $\alpha$ and rearranging yields:

$$\frac{\partial LHS(\alpha)}{\partial \alpha} = -\beta_\ell \frac{1}{\omega_{j_\ell}} \omega_{j_\ell}(\ln \beta_{j_\ell})^2 (1 - \alpha \omega_{j_\ell})^2 < 0.$$ 

That is, if $LHS(\alpha) < 1$ holds for $\alpha = 0$, it holds a fortiori for all $\alpha \in (0,1)$. In fact, $LHS(0) < 1$ for all $\beta_{j_\ell} \in (0,1)$. This implies $\frac{\partial \pi^D_\ell}{\partial \mu_{j_\ell}} < 0$.

(ii) $H$’s deviation profits decrease in $\mu_m$:

$$\frac{\partial \pi^DH_\ell}{\partial \mu_m} = -\beta_\ell \alpha \eta_m \left( e^{\alpha \eta_h} e^{-\alpha \eta_m} \right)^{\frac{1}{1 - \alpha}} 2AEQ_N^{\frac{1}{1 - \alpha}} < 0.$$ 

By changing subscripts it is readily shown that $\frac{\partial \pi^DM_\ell}{\partial \mu_m} < 0$.

(iii) The reaction of party $J$’s deviation profits on the increase in $\mu_{j_\ell}$:

$$\frac{\partial \pi^DJ_\ell}{\partial \mu_{j_\ell}} = -\alpha \eta_j \left[ \beta_\ell \frac{1}{\omega_{j_\ell}} \ln \beta_{j_\ell} - \frac{1}{\beta_{j_\ell}} + \beta_{j_\ell} \right] \left( e^{\alpha \eta_h} e^{-\alpha \eta_m} \right)^{\frac{1}{1 - \alpha}} 2AEQ_N^{\frac{1}{1 - \alpha}}$$

is ambiguous since the term in the squared brackets can be both positive and negative. This term is more likely to be positive (i.e., $\frac{\partial \pi^DJ_\ell}{\partial \mu_{j_\ell}}$ is more likely to be negative) the higher $\omega_{j_\ell}$, i.e., the lower $\mu_{j_\ell}$ and the higher $\eta_j$.

(iv) It immediately follows from the transformation of the term in the squared brackets that $\frac{\partial \pi^DM_\ell}{\partial \mu_m} > 0$ if and only if $\beta_\ell \frac{1}{\omega_{j_\ell}} (1 - \frac{\ln \beta_{j_\ell}}{1 - \alpha \omega_{j_\ell}}) > 1$. 

30
E Proof of Lemma 5

In order to show that \( Q(\beta_mS) \equiv \beta_mS^{\frac{\omega_mS}{1-\alpha \omega_mS}} \left(1 - \frac{\ln \beta_mS}{1-\alpha \omega_mS}\right) > 1 \) if \( \beta_mS > e^{\frac{1-\alpha}{1-\alpha(1-\omega_mS)}} \) and \( \omega_mS < 3/4 \), I proceed in two steps. Concerning the corner solution of \( Q(\beta_mS) \), it immediately follows that \( Q(1) = 1 \) for all \( \alpha, \omega_mS \in (0, 1) \).

Second, the first order derivative of \( Q(\beta_mS) \) with respect to \( \beta_mS \):

\[
\frac{\partial Q(\beta_mS)}{\partial \beta_mS} = \frac{\alpha \omega_mS \beta_mS^{\frac{\omega_mS}{1-\alpha \omega_mS}}}{1 - \alpha \omega_mS} \left(1 - \frac{\ln \beta_mS}{1-\alpha \omega_mS}\right) - \frac{\beta_mS^{\frac{\omega_mS}{1-\alpha \omega_mS}} - 1}{1 - \alpha \omega_mS}
\]

is negative if and only if \( Q_1(\beta_mS) \equiv [\alpha \omega_mS \ln \beta_mS + (1 - \alpha \omega_mS)^2] > 0 \). Notice that \( Q_1(\beta_mS) \) is increasing in \( \beta_mS \). That is, if \( Q_1(\beta_mS) > 0 \) holds for the lowest \( \beta_mS \), it holds a fortiori for all \( \beta_mS \in (\beta_mS^{min}, 1) \). By substituting \( \beta_mS = e^{\frac{1-\alpha}{1-\alpha(1-\omega_mS)}} \) in \( Q_1(\beta_mS) \), it can be easily verified that the resulting expression is greater than zero (i.e., \( \frac{\partial Q(\beta_mS)}{\partial \beta_mS} < 0 \)) for all \( \alpha \in (0, 1) \) iff \( \omega_mS < 3/4 \). Combining this result with \( Q(\beta_mS = 1) = 1 \) implies Lemma 5.

F Numerical example

This section provides a numerical simulation to illustrate \( H \)'s endogenous choices of \( \ell \in \{N,S\} \) and \( G^* \in \{S,R\} \) in the game specified in figure 1. These choices are completely characterized by the exogenous parameters \( \eta_h, \beta_{h\ell}, \mu_{h\ell}, \mu_{m\ell}, \alpha, w_N, w_S, \tau, r_N, r_S \). I impose the following assumptions with regard to these parameters. I choose \( \alpha = 0.8 \), which corresponds to \( \sigma = 5 \) (the value of demand elasticity commonly assumed in the literature). The headquarter intensity, \( \eta_h \) as well as headquarter's revenue share, \( \beta_{hN} = \beta_{hS} \) are assumed to be one half independent of the location of \( M \). I assume that two-thirds of activities which are provided in \( N \) can be verified by courts, i.e., \( \mu_{hN} = \mu_{hS} = \mu_{MN} = 2/3 \), whereas only one-third of \( M \)'s activities in \( S \) are contractible, i.e. \( \mu_{mS} = 1/3 \). Utilizing these parameters in \( ICC \) from (12) yields cutoff values \( \bar{r}_S \approx 1.3 \) and \( \bar{r}_N \approx 1.5 \). Figure 4 depicts all incentive compatible governance modes in \( \ell \in \{N,S\} \).

![Figure 4: Incentive compatible governance modes.](image-url)
Assume first that \( r_N \) lies below \( \bar{r}_N \), so that \( H \) can enter a self-enforcing implicit agreement with a northern manufacturing supplier and earn \( V_{HN}^R \). By considering the option of offshoring, the headquarter anticipates whether she will be able to enter a relational agreement with a southern supplier (if \( r_S < \bar{r}_S \)), or will cooperate with him on the spot (if \( r_S > \bar{r}_S \)). In the former case, the headquarter compares \( V_{HN}^R \) with \( V_{HS}^R \) and decides in favor of offshoring under \( R \) if and only if \( V = \frac{V_{HN}^R}{V_{HS}^R} < 1 \), see equation (14). Figure 5 plots the implicit function \( V = \frac{V_{HN}^R}{V_{HS}^R} = 1 \) for all possible \( r_S \in (0, 1.3) \) and \( N\)'s relative cost disadvantage, \( \frac{w_N}{\tau_{WS}} \), in the range (1, 2). All combinations of \( r_S \) and \( \frac{w_N}{\tau_{WS}} \) span the locus of \( r_N \) such that the headquarter prefers relational contracting in \( S \) over relational contracting in \( N \) if \( r_N \) lies above this locus.\(^{22} \) If, on the contrary \( r_S > \bar{r}_S \), the headquarter compares \( V_{HN}^R \) with \( V_{HS}^S \) and decides in favor of offshoring under \( S \) if and only if \( V = \frac{V_{HN}^R}{V_{HS}^S} < 1 \). Figure 6 plots the implicit function \( V = \frac{V_{HN}^R}{V_{HS}^S} = 1 \) for a given range of \( r_S \in (1.3, 2) \) and \( \frac{w_N}{\tau_{WS}} \in (1, 2) \). Again, all combinations of \( r_S \) and \( \frac{w_N}{\tau_{WS}} \) span the locus of \( r_N \) such that the headquarter prefers spot contracting in \( S \) over relational contracting in \( N \) if \( r_N \) lies above this locus (but below \( \bar{r} = 1.5 \)).

\[ \begin{align*}
\text{Figure 5: } & \frac{V_{HN}^R}{V_{HS}^S} = 1, \forall r_S \in (0, 1.3), \frac{w_N}{\tau_{WS}} \in (1, 2). \\
\text{Figure 6: } & \frac{V_{HN}^R}{V_{HS}^S} = 1, \forall r_S \in (1.3, 2), \frac{w_N}{\tau_{WS}} \in (1, 2).
\end{align*} \]

Assume next that \( r_N \) lies above \( \bar{r}_N \), so that a headquarter can cooperate with a northern supplier merely on the spot. Yet, the headquarter is willing to offshore manufacturing production if \( r_S < \bar{r}_S \) and \( V = \frac{V_{HN}^S}{V_{HS}^S} < 1 \) or \( r_S > \bar{r}_S \) and \( V = \frac{V_{HN}^S}{V_{HS}^S} < 1 \). Figure 7 depicts on the vertical axis the locus of \( r_N \) which satisfies \( V = \frac{V_{HN}^S}{V_{HS}^S} = 1 \) for all \( r_S \in (0, 1.3) \) and \( \frac{w_N}{\tau_{WS}} \in (1, 2) \). If the current level of \( r_N \) is above this locus and above \( \bar{r}_N = 1.5 \), the headquarter will prefer production under \( R \) in the South over spot cooperation in the North. Figure 8 depicts on the vertical axis the locus of \( r_N \) which satisfies \( V = \frac{V_{HN}^S}{V_{HS}^S} = 1 \) for all \( r_S \in (1.3, 2) \) and \( \frac{w_N}{\tau_{WS}} \in (1, 2) \). If the current level of \( r_N \) is above this locus and above \( \bar{r}_N = 1.5 \), the headquarter will prefer \( S \) in the North over \( S \) in the South.

\(^{22} \) Recall, however, that \( r_N \) cannot exceed \( \bar{r}_N = 1.5 \), since otherwise \( R \) in \( N \) would not be possible.
The patterns of figures 5, 6, 7 and 8 confirm the general logic of Proposition 2: Manufacturing production is more likely to be offshored the higher is \( \frac{w_N}{\tau w_S} \) and the lower is \( r_S \).

\[ \text{Figure 7: } \frac{v_{h_N}^N}{v_{h_S}^N} = 1, \forall r_S \in (0, 1.3), \frac{w_N}{\tau w_S} \in (1, 2). \]

\[ \text{Figure 8: } \frac{v_{h_S}^N}{v_{h_S}^S} = 1, \forall r_S \in (1.3, 2), \frac{w_N}{\tau w_S} \in (1, 2). \]

**G Proof of Proposition 4**

Bearing in mind Assumption 2, simple differentiation of (16) yields:

(i) \( \frac{\partial \Theta_{h}^S}{\partial \mu_h} = \frac{\alpha m}{1-\alpha} \Theta_{h}^S (\ln \beta_{hO} - \ln \beta_{hL}) < 0 \), since \( (\ln \beta_{hO} - \ln \beta_{hL}) < 0 \).

(ii) \( \frac{\partial \Theta_{m}^S}{\partial \mu_m} = \frac{\alpha m}{1-\alpha} \Theta_{h}^S (\ln \beta_{mO} - \ln \beta_{mL}) > 0 \), since \( (\ln \beta_{mO} - \ln \beta_{mL}) > 0 \).

(iii) \( \frac{\partial \Theta_{h}^S}{\partial \eta_h} = \frac{\alpha}{1-\alpha} \Theta_{h}^S ((1 - \mu_h) [\ln \beta_{hL} - \ln \beta_{hO}] + (1 - \mu_m) [\ln \beta_{mO} - \ln \beta_{mL}]) > 0 \), since the expressions in the squared brackets are greater than zero.

**H Proof of Proposition 6**

It follows from simple differentiation of (17) with respect to \( r_L \) that \( \frac{\partial \Theta_{im}^S}{\partial r_L} > 0 \) if and only if

\[
\pi_{DM}^S \pi_{MIO}^S - \pi_{MII}^S \pi_{MIO}^S > 0,
\]

Plugging (7) and (11) in the above expression yields:

\[
Z \equiv \beta_{mO} \left[ \beta_{oim}^m \left( 1 - \alpha \omega_{mL} \right) - \alpha \left( 1 - (\omega_{hL} + \omega_{mL}) \right) \right] \beta_{mI} \left( \beta_{hO} \beta_{mO} \right)^{1-\alpha} (1 - \alpha (1 - \omega_{hL})) - \beta_{mI} \left[ \beta_{oim}^m \left( 1 - \alpha \omega_{mL} \right) - \alpha \left( 1 - (\omega_{hL} + \omega_{mL}) \right) \right] \beta_{mO} \left( \beta_{hO} \beta_{mO} \right)^{1-\alpha} (1 - \alpha (1 - \omega_{hL})) > 0.
\]
Bearing in mind that expressions in the squared brackets are positive (cf. Assumption 1), \( Z > 0 \) is readily proven if

\[
Z_1 = \beta_{mI} \left[ \frac{\alpha \omega_{ml}}{\beta_{mO}} (1 - \alpha \omega_{ml}) - \alpha(1 - (\omega_{hl} + \omega_{ml})) \right] \beta_{mI}(1 - \alpha(1 - \omega_{hl}))
- \beta_{ml} \left[ \frac{\alpha \omega_{ml}}{\beta_{mI}} (1 - \alpha \omega_{ml}) - \alpha(1 - (\omega_{hl} + \omega_{ml})) \right] \beta_{mI}(1 - \alpha(1 - \omega_{hl})) > 0
\]

and

\[
Z_2 = (\beta_{mO}^\omega h) - (\beta_{mI}^\omega h) > 0 \text{ simultaneously hold.}
\]

Since \( \beta_{mO} > \beta_{mI} \) (cf. Assumption 2), it can be immediately seen that \( Z_1 > 0 \) for all possible parameter values. In contrast, \( Z_2 > 0 \) holds if and only if

\[
Z_3 \equiv \left( \frac{\beta_{hl}^\omega}{\beta_{hO}^\omega} \right) \omega_{hl} \left( \frac{1 - \beta_{hl}}{1 - \beta_{hO}} \right) > 1
\]

Bearing in mind that \( \beta_{hl} > \beta_{hO} \) (due to Assumption 2), simple differentiation of \( Z_3 \) yields:

(i) \( \frac{\partial Z_3}{\partial \mu_{hl}} = -\eta_h \ln \left( \frac{\beta_{hl}}{\beta_{hO}} \right) Z_3 < 0, \)

(ii) \( \frac{\partial Z_3}{\partial \mu_{ml}} = - (1 - \eta_h) \ln \left( \frac{1 - \beta_{hl}}{1 - \beta_{hO}} \right) Z_3 > 0 \)

(iii) \( \frac{\partial Z_3}{\partial \eta_h} = \left[ (1 - \mu_{hl}) \ln \left( \frac{\beta_{hl}}{\beta_{hO}} \right) - (1 - \mu_{ml}) \ln \left( \frac{1 - \beta_{hl}}{1 - \beta_{hO}} \right) \right] Z_3 > 0. \)