Foreign market entry under incomplete contracts ‡

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Abstract
In this paper, I show that incomplete contracts affect a firm’s decision about serving foreign customers through exports or local sales from an affiliated plant. When contracts between two agents within a firm are too costly to write, the share of multinational firms may be higher or lower compared to a world without contractual frictions. Industries that technologically require more inputs from the management unit as compared to inputs from a component supplier have a higher propensity to engage in foreign direct investment. This industry pattern is in line with stylized facts on US exports and affiliate sales.

JEL-Classification: F12; F15; F23
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1 Introduction

Advancements in communication and computer technology allow firms to coordinate complex production processes within large organizational structures. It is common in modern manufacturing that a large number of agents contributes to a final product even within firm boundaries. While this development may lead to productivity gains, the increasing specificity of tasks often renders intra-firm contracts between agents difficult to write. This is especially true if the characteristics of the intermediate inputs cannot be verified by third parties. If agents cannot commit not to renegotiate an initial contract, the hold-up problem leads to a suboptimal outcome where agents may produce too little of the required inputs by not hiring enough workers or by providing too little effort.

In this paper, I show that incomplete contracts play a crucial role for the mode of foreign market entry. In a model where firms choose between foreign direct investment (FDI) to serve customers through local sales and exporting, contractual frictions may encourage or discourage FDI compared to a standard trade model where complete contracting prevails. Industries that technologically require a higher input share of management services as compared to component inputs have a higher propensity to engage in FDI. This insight is in line with stylized facts for US exports and foreign affiliate sales. Further, the model allows for the case that the share of horizontal multinational firms decreases in trade costs. This finding is at odds with the well-known proximity-concentration trade-off (Markusen, 1984, Brainard, 1997) where more firms tend to prefer FDI at higher levels of trade barriers to save transport costs. The model thus suggests a novel mechanism explaining the increasing importance of FDI in times of falling trade barriers (Lommerud, Meland and Sørgard, 2003).

The paper builds on the notion that contracts are incomplete even within the firm. The so-called property-rights approach to the theory of the firm roots in seminal work by Williamson (1985) and Grossman and Hart (1986). They argue that ownership rights affect the bargaining position of agents which may increase or decrease profits of the integrated company thus determining the boundaries of
the corporation. Antràs (2003) applied this idea to the vertical integration decision of multinational enterprises (MNE) to explain the pattern of intra-firm trade. In a similar vein, Antràs and Helpman (2004) derive determinants of global sourcing decisions in a heterogeneous-firms model where incomplete contracts shape the organizational structure of multinational enterprises.¹ Du, Lu and Tao (2009) extend the Antràs and Helpman (2004) framework in considering bi-sourcing. In their model, the most productive firms choose an organizational structure where intermediate goods are sourced from an outside supplier and an in-house production unit to improve production efficiency. A recent empirical literature provides broad evidence in favor of the incomplete-contracting mechanism.²

This paper has nothing to say about the boundaries of the firm, but identifies incomplete contracts as a novel determinant for the mode of foreign market entry instead.³ In contrast to the literature discussed above, firm boundaries are exogenous in my model by assuming that intermediate goods are solely fabricated in-house. This assumption helps focussing on the novel aspect in the incomplete-contracts literature – that is the implications for the organizational choice between exports and FDI. Unless one considers complementarities between the vertical and horizontal dimension of firm organization, we should expect no additional insights from considering both aspects at the same time. Moreover, in an international context, vertical FDI is driven by factor-price differences whereas horizontal FDI aims at servicing consumers in foreign markets. To keep the focus sharp, I restrict the analysis to the horizontal motive for FDI and consider a model of two countries that are identical in all respects. Hence, this paper should be viewed as a complement to the incomplete-contracts literature dealing with the make-or-buy decision of firms.

Incomplete contracts have implications for the attractiveness of FDI. Every firm (plant) consists of two units, a management unit and a component supplier each contributing an intermediate input for final assembly. The management owns the

¹Other examples comprise Antràs (2005) and Carluccio and Fally (2010).
³See Markusen (2002) and Barba Navaretti and Venables (2004) for a more detailed discussion of other potential determinants for FDI.
property rights of the component supplier and chooses the mode of foreign market entry. As no enforceable contract can be written between the two parties within the firm, each party under-invests according to the respective share they obtain of the joint surplus in the ex-post bargaining. The key idea is that the management has a stronger bargaining position in a multinational organization because it can at least partly service one market through component exports from its plant in the other country in case the negotiations fail. Obviously, this effect becomes more pronounced at lower trade costs.\(^4\)

However, a stronger bargaining position does not necessarily increase profits. If the revenue share of the management becomes larger, the ex-ante investment incentives of the component supplier become weaker while the management’s under-investment is attenuated. Technology then tips the scales. If the required share of management inputs is small, the more severe under-investment of the component supplier tends to dominate the higher supply of management inputs resulting in a lower overall profit level. In that case, incomplete contracts discourage FDI. If technology requires a large input share from the management unit, however, contractual frictions encourage FDI as the implied stronger bargaining position of the management leads to higher profits. Hence, this mechanism gives rise to an industry pattern of FDI where management-intensive industries have a higher propensity to set up foreign plants to serve customers in that market.

As both the proximity-concentration trade-off and incomplete contracts operate in the model, a reduction in trade costs generally has two effects. (i) From the former channel, it makes exporting relatively more attractive compared to FDI, and (ii) incomplete contracts may stimulate either exporting (at low management intensity) or FDI (at high management intensity). As the second channel may dominate the first when the management input share is large, the model establishes

\(^4\)The idea that globalization strengthens the bargaining position of multinational firms has also been emphasized in the trade union literature by Eckel and Egger (2009). As the organizational choice affects the wage level, unionization may work as an independent determinant for FDI. Lommerud, Meland and Sørgard (2003) argue in a different framework that trade liberalization may encourage foreign direct investment as the firm can thereby avoid higher union wages.
a novel explanation for why FDI may increase in times of falling trade costs.\footnote{Neary (2009) also highlights this stylized fact and discusses intra-regional trade liberalization and cross-border mergers as alternative explanations.}

Moreover, the model generates hypotheses that can be tested straightforwardly. As technological differences across sectors play a crucial role in determining the effect of trade costs (distance), this information can be exploited in potential empirical work. First, we should expect a lower share of affiliate sales in industries that depend less on inputs directly controlled by the management. And second, the share difference across sectors should decrease in distance. In a related paper, Keller and Yeaple (2010) argue that affiliate sales decrease in distance due to costly technology transfer and imperfect communication between the headquarter and its affiliate. They derive and test the hypothesis that affiliate sales decrease more in distance in knowledge-intensive industries as technology transfer is relatively more costly there. However, their model differs in that they discuss a trade-versus-FDI trade-off at the intermediate goods level which is driven by costly technology transfer and which does not depend on incomplete contracts.

This paper is organized as follows. I present the model in section 2 and study the role of incomplete contracts for foreign direct investment under trade liberalization in section 3. Section 4 presents stylized facts that are in line with the prediction of the model. Section 5 offers concluding remarks and discusses potential paths for future research.

## 2 The model

Consider a world with two identical countries where labor is the only factor of production. Consumer preferences over a differentiated good $X$ and a homogeneous commodity $Y$ are described by the utility function

$$U = C_X^\gamma C_Y^{1-\gamma}, \quad 0 < \gamma < 1$$

\footnote{Neary (2009) also highlights this stylized fact and discusses intra-regional trade liberalization and cross-border mergers as alternative explanations.}
where $C_X$ and $C_Y$ represent the respective consumption levels of each good with 
$C_X \equiv \left(\int_{v \in V} c_x(v)^\alpha dv\right)^{1/\alpha}$ being a CES-aggregator composed of a mass $V$ of differentiated varieties. The parameter $0 < \alpha < 1$ governs the elasticity of substitution between any two varieties given by $\varepsilon = 1/(1 - \alpha)$. Utility maximization delivers demand for variety $v$

$$c_x(v) = \frac{\bar{p}(v)^{-\varepsilon}}{P} \gamma E,$$

where $P = \int_{v \in V} \bar{p}(v)^{1-\varepsilon} dv$ represents a consumer price index of the differentiated good, $\bar{p}(v)$ is the consumer price of variety $v$ and $E$ denotes total income. As individuals spend constant shares of their income on each good, we get $C_X = \gamma E/P$ and $C_Y = (1 - \gamma) E/P_Y$.

One unit of labor is required to produce one unit of the homogeneous good being sold in a perfectly competitive market. As I assume zero transport costs for $Y$, I normalize its price, $P_Y$, to unity and choose it as numéraire. Labor mobility across sectors then pins down wages in both countries to one. In the $X$-sector, firms behave as monopolists facing a constant elasticity of substitution. They have to invest $f$ units of labor to set up a plant in their domestic market. To serve customers abroad, firms can choose between exporting (subscript $e$) and foreign direct investment (subscript $m$). While the former implies iceberg transport costs such that $\tau > 1$ units have to be shipped for one unit to arrive at the final destination abroad, setting up a foreign affiliate requires a fixed investment of $f_m$ units of labor.

Each company consists of two entities: (i) a management unit $H$ supplying an intermediate input $h$ and deciding about the organizational structure of the firm; and (ii) a component production unit $Q$ supplying $q$. Both inputs are characterized by the same production technology as the numéraire good with one unit of labor required for one unit of output. To obtain a variety of the differentiated good, these two inputs need to be combined at zero costs according to the following technology

$$x(\varphi) = \varphi \left(\frac{h}{\eta}\right)^\eta \left(\frac{q}{1 -\eta}\right)^{1-\eta},$$
where $\eta$ determines the relative importance of each input in the final assembly and $\varphi$ denotes a firm-specific productivity level drawn from a commonly-known distribution function $G(\varphi)$.

To found a company, the management has to find a component supplier to engage in a specific relationship. With an infinitely elastic supply of $Q$, the management offers a contract specifying a fee for the right to exclusively supply a component for the final variety. Although both entities become part of the same company and the management owns the property rights of $Q$, each party decides about the output levels of $h$ and $q$ in an uncoordinated fashion. This notion is based on the property-rights approach to the theory of the firm postulating that contracting is incomplete even within organizational structures. According to seminal papers by Grossman and Hart (1986) and Hart and Moore (1999), agents cannot commit not to renegotiate about joint profits after intermediate outputs have been produced because the precise characteristics of the two goods are only revealed after the investment is sunk. As writing a contract specifying which intermediate good has to be delivered under each state of the world would be too costly, agents bargain ex post about the joint surplus of the relationship.

This idea has been applied to the internalization decision of multinational firms choosing between in-house production and outsourcing. As the choice of ownership affects ex-post outside options in the bargaining and thus ex-ante investment incentives of agents, incomplete contracting may give rise to arm’s-length transactions or vertical integration – depending on industry characteristics. I deviate from this literature as ownership is not a choice variable in this model. Here, the management owns the component supplier under both exporting and foreign direct investment so that this channel cannot affect the agents’ bargaining position. What does affect the bargaining power, however, is a combination of the organizational choice and trade costs. While the bargaining power of both agents within the firm is exogenous for exporting firms, foreign investment strengthens the position of the management. This is based on the idea that the management of the multinational firm can satisfy

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6Note that in contrast to the production decisions, the "partnership contract" is complete.

7See, for example, Antràs (2003, 2005) and Antràs and Helpman (2004).
the demand of local customers to some extent $0 < \lambda < 1$ by importing components from its foreign affiliate if negotiations fail. This leads to a strictly higher outside option for $H$ under foreign direct investment than under exporting. For convenience, I normalize the fall-back option for component suppliers under both organizational forms and the fall-back option for the management under the exporting status to zero. Thus, parties negotiate about a smaller revenue level in a multinational firm than they would in the exporting regime.\(^8\)

Labeling firm revenues by $r$ and accounting for trade costs, the outside option of the MNE-management is $\lambda \phi r$ with $0 \leq \phi \equiv \tau^{1-\varepsilon} \leq 1$ denoting a trade freeness measure. Hence, $H$ receives its outside option plus a fraction $\beta$ of the quasi-rents, such that $\lambda \phi r + \beta (1 - \lambda \phi) r$, while $Q$ gets $(1 - \beta) (1 - \lambda \phi) r$. I follow the notion that a stronger bargaining power translates into a larger revenue share. For simplicity, I use both terms interchangeably and refer to them as $\beta$. The management revenue shares for both firm types can thus be summarized as follows:

$$\beta_m = \beta + \lambda \phi (1 - \beta) \geq \beta_e = \beta.$$ (4)

It is evident from (4) that the bargaining weights are only identical for both firm types if trade costs are prohibitively high, that is $\phi = 0$, and that $\beta_m$ exceeds $\beta_e$ more at lower levels of trade costs.

The management unit chooses $h$ to maximize $\beta_l r_l - h_l$ for each market while the component supplier $Q$ maximizes $(1 - \beta_l) r_l - q_l$ with respect to $q$, where $l = e, m$. Taking the inverse demand based on (2) to compute revenues and plugging in (3) allows us to derive the optimal supply levels of $h_l$ and $q_l$ from the two parties' demand.

\(^8\)Note that I abstract from the case where $H$ can seize the inputs $q$ and fire the manager of the component supplying unit. This can be motivated by the notion that both parties have to be active in assembling the final good due to specific know-how. Beyond this, the assumption is innocent as the outside options of $H$ would be identically affected under both organizational forms.
perspectives. We then obtain profits of exporters and multinational firms as

\[ \pi_e(\varphi) = (1 + \phi) \frac{(1 - \tilde{\alpha}_e) p_e^{1-\varepsilon}}{P} \gamma E - f \]

\[ \pi_m(\varphi) = 2 \frac{(1 - \tilde{\alpha}_m) p_m^{1-\varepsilon}}{P} \gamma E - f - f_m, \tag{5} \]

where \( \tilde{\alpha}_l = \alpha [\beta_l \eta + (1 - \beta_l) (1 - \eta)] \). Accounting for the incomplete contracting environment, the profit-maximizing producer price is given by

\[ p_l(\varphi) = \frac{1}{\alpha \varphi \beta_l^{1-\eta}}. \tag{6} \]

Following Do and Levchenko (2009), a fixed mass \( N \) of management units can potentially enter the market. Each management knows the firm-specific productivity level \( \varphi \) and selects the organizational structure that ensures maximum profits. With an infinitely elastic supply of component producers and a zero outside option of this agent, the fee that \( Q \) has to pay upfront to engage in the specific relationship with \( H \) equals the profit accruing to this agent. Hence, all profits fall onto the management unit in a subgame-perfect equilibrium.\(^{10}\) Note further that there might potentially be both intermediate and final goods trade. However, bargaining does not fail in equilibrium and shipments of intermediates purely work as a threat in the negotiations.

To see the impact of incomplete contracts on organizational choice, it is useful to define \( \Delta \pi(\varphi) \equiv \pi_m(\varphi) - \pi_e(\varphi) \). This yields

\[ \Delta \pi(\varphi) = [2 \Omega - (1 + \phi)] \frac{(1 - \tilde{\alpha}_e) p_e^{1-\varepsilon}}{P} \gamma E - f_m, \tag{7} \]

where

\[ \Omega = \frac{1 - \tilde{\alpha}_m}{1 - \tilde{\alpha}_e} \left[ \frac{\beta_m (1 - \beta_m^{1-\eta})}{\beta_e (1 - \beta_e^{1-\eta})} \right]^{\epsilon-1}. \]

\(^9\)See Appendix A for a derivation.

\(^{10}\)See Antrás and Helpman (2004) for a more detailed discussion of subgame perfectness in the Nash bargaining.
We observe from (7) that incomplete contracts give rise to an additional channel beyond the proximity-concentration trade-off influencing the foreign market entry mode decision. In the case of perfect contracts, $\Omega = 1$ and we obtain the standard result that more productive firms select foreign direct investment while those firms with a lower productivity level serve foreign customers through exports. The intuition for this outcome relates to the insight that high-productivity firms sell more and earn higher profits rendering the coverage of additional fixed costs for setting up a foreign affiliate relatively easier (see Helpman, Melitz and Yeaple, 2004). However, when contracts cannot be written between agents within the firm at reasonable costs, $\Omega$ deviates from unity. The direction of change can be both positive or negative so that contractual frictions may encourage or discourage FDI. The value of $\Omega$ crucially depends on the interplay between the bargaining weights $\beta_l$ and the technology parameter $\eta$.

If the management was able to choose the bargaining power (revenue share) that maximizes joint profits, referred to as $\beta^*$, it would select a higher $\beta$ the higher its input contribution as measured by $\eta$. As illustrated in Figure 1, $\beta^*(\eta)$ is mono-
tonically increasing in $\eta$ with $\beta^*(0) = 0$ and $\beta^*(1) = 1$. The positive slope of this function becomes intuitively clear if one focuses on the impact of an increase in the management’s bargaining weight on the investment incentives for each party. Both agents produce inefficiently low levels of their intermediate goods as they only receive a fraction of the marginal returns to their investments. A higher $\beta$ fosters the component supplier’s under-investment in $q$ exerting a negative impact on joint output according to (3) while the incentives for the management work in the opposite direction. If the contribution of the component supplier is low ($\eta$ is high), the management prefers a higher bargaining power to extract a higher share of joint revenues because the more severe under-investment in components weighs relatively little. On the contrary, if $\eta$ is low and components make up for a large fraction of inputs in production, the management prefers a lower revenue share in the bargaining to avoid a severe under-investment in components. I follow the literature in assuming that the management cannot choose the optimal level of $\beta$, but only has the choice between two bargaining positions by choosing the organizational structure of the firm. This can be rationalized by arguing that the management cannot commit not to take advantage of the outside option under foreign direct investment and the component supplier takes this behavior into account.

As interior solutions allowing for co-existence of both exporters and multinational firms are most interesting, I assume that the fixed cost of setting up a foreign affiliate is sufficiently high such that the least productive firm in the market earns strictly higher profits from exporting than foreign direct investment. Denoting by $\varphi^*_e$ the productivity level associated with zero profits of the least productive firm, $\Delta \pi (\varphi^*_e) < 0$ yields the sufficient condition

$$ f_m > \left[ \frac{\Omega}{1 + \phi} - 1 \right] f $$

which is assumed to hold throughout the analysis.

\footnote{This figure is borrowed from Antrás and Helpman (2004).}
3 Trade liberalization and FDI

To obtain closed-form solutions, I take advantage of Pareto-distributed productivity levels according to $G(\varphi) = 1 - \varphi^{-k}$, with the scale parameter (pinning down the lowest possible productivity level a firm can draw) being normalized to unity. Higher values of the shape parameter $k$ indicate a higher probability of drawing a low $\varphi$.

Obtaining the cutoff productivity of multinational firms from $\Delta \pi(\varphi^*_m) = 0$, the share of multinational companies is given by

$$\mu = \left( \frac{\varphi^*_e}{\varphi^*_m} \right)^k = \left[ \frac{f}{f_m} \left( \frac{2\Omega}{1 + \phi} - 1 \right) \right]^\frac{k}{1 - \epsilon}. \quad (8)$$

Since $\Omega$ can generally be smaller or larger than unity, incomplete contracts have an ambiguous effect on $\mu$. Recall that firm profits increase in $\beta$ whenever $\beta < \beta^*$ and vice versa. For illustrative reasons, I thus depict two distinct cases: (i) one where $\beta < \beta^*$ and (ii) another where $\beta > \beta^*$ as shown in Figure 1. The arrows in the figure indicate the direction of changes in $\beta$ that are associated with increases in firm profits.

In component-intensive industries, the management would prefer a rather low bargaining power in order to avoid a severe under-investment of the component supplying unit – and thus a suboptimally-low joint profit level. However, choosing a multinational organizational structure moves the bargaining weight up compared to an exporting firm rendering profits under foreign direct investment lower for a larger number of firms. If $\beta$ falls short of the profit-maximizing level, however, incomplete contracts provide a novel mechanism to increase firm profits of multinational firms: through a stronger bargaining position of the management vis-à-vis the component supplier. As a consequence, a higher number of firms prefers foreign direct investment to exporting. These two distinct cases are contrasted in Figure 2 with the benchmark case of no contractual frictions (dashed line) for the range from prohibitively high trade costs ($\phi = 0$) to free trade ($\phi = 1$).\(^\text{12}\)

\(^\text{12}\)The parameters underlying Figure 2 are as follows: $\alpha = 0.8$, $\lambda = 0.1$, $f = 1$, $f_m = 2$, and $k = 5$. 

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Note that the share of multinational firms is affected by two mechanisms in this framework: (i) the proximity-concentration trade-off, and (ii) incomplete contracts. The former channel in isolation causes $\mu$ to decline in $\phi$ because exporting becomes relatively more attractive at lower levels of trade costs. Obviously, horizontal multinational activity ceases when trade is free. When contracts are incomplete, multinational activity may be higher or lower compared to complete contracting, but coincides when trade costs are prohibitively high. The latter must be true because the outside option of the management is also zero under FDI as the management does not have the opportunity to import components from its foreign plant such that $\beta_e = \beta_m$. Hence, becoming a multinational firm does not imply any additional advantage. Denoting by $\hat{\mu}$ the share of multinational firms under incomplete contracts and by $\mu$ the benchmark case, we can conclude that $\hat{\mu} < \mu$ whenever $\beta > \beta^*$. Choosing $\lambda$ such that $\beta_m \leq \beta^*$ for all $\phi$, we can further conclude that $\hat{\mu} > \mu$ whenever $\beta < \beta^*$. In that case, there is an incentive to engage in foreign direct investment even when trade is entirely free because the increase in operating profits due to a higher bargaining weight compensates for the additional fixed costs $f_m$.\footnote{Generally, when $\lambda$ is sufficiently high such that an increase in $\phi$ boosts $\beta_m$ beyond the profit-maximizing level $\beta^*$, the share of multinational firms may drop below the benchmark level under...
The model also allows for the case where the share of multinational firms increases when trade barriers fall. Starting from a scenario where $\beta < \beta^*$, a reduction in trade costs generally has two effects. First, profits of exporters strictly rise relative to those of multinational firms due to the proximity-concentration trade-off. While trade costs fall, the fixed costs of setting up a foreign affiliate remain unaffected. Second, as profits increase in the bargaining weight in this case, trade liberalization raises profits of multinational firms relative to those of exporting firms since $\beta_m$ monotonically grows in $\phi$. Starting from a low level of $\beta$, a reduction in trade costs may raise the management’s bargaining power sufficiently much such that the implied increase in profits from choosing FDI due to the bargaining channel dominates the relative increase in profits of exporting firms due to the proximity-concentration trade-off.

What implications do incomplete contracts have for the share of affiliate sales in overall sales of foreign-owned firms in a given market? To shed light on this question, it is useful to calculate the ratio of export revenues relative to revenues of complete contracts for lower levels of trade costs.
affiliated plants. Denoting this measure by $\tilde{\rho}$, we get

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\tilde{\rho} = \phi \left[ \frac{\beta_m (1 - \beta_m)^{1-\eta}}{\beta_m (1 - \beta_m)^{1-\eta}} \right]^{1-\epsilon} \left\{ \left[ \left( \frac{2\Omega}{1 + \phi} - 1 \right) \frac{f}{f_m} \right]^{\frac{\eta - \epsilon - 1}{\epsilon - 1}} - 1 \right\}.
$$

(9)

It is then straightforward to calculate the value of affiliate sales relative to the sum of exports and affiliate sales as $\rho = 1/(1 + \tilde{\rho})$. Figure 3 plots this ratio as a function of trade freeness for the same scenarios as in Figure 2. Obviously, the value of exports is zero at prohibitively high trade costs ($\phi = 0$), so $\rho = 1$. When contracts are complete, $\rho$ is decreasing in $\phi$ with frictionless trade implying zero affiliate sales. This benchmark is represented by the dashed line in the figure. Note that two effects are responsible for this relationship: (i) a price-demand effect as a reduction in trade costs increases the value of exports; and (ii) a selection effect as exporting becomes the preferred mode of foreign market entry at lower levels of trade barriers. In the benchmark, both channels work in the same direction causing a negative link between the share of affiliate sales and trade freeness.

How do incomplete contracts modify this relationship? If the revenue share of the management is above the profit-maximizing level $\beta^*$ ($\eta = 0.3; \beta = 0.5$), an increase in $\phi$ implies a lower share of affiliate sales compared to the benchmark. First, trade liberalization affects the producer price of multinational firms under incomplete contracts according to (6). With $\beta < \beta^*$, an increase in $\phi$ increases the producer price of MNEs leading to both lower demand and profits. This in turn stimulates more firms to choose exporting as compared to foreign direct investment magnifying the selection effect of the proximity-concentration trade-off when trade costs decline. Recall that the share of multinational firms in the total number of operating firms falls short of the one under the benchmark scenario.

If the management’s revenue share is smaller than the profit-maximizing level $\beta^*$ ($\eta = 0.7; \beta = 0.5$), we observe a higher level of $\rho$. Trade liberalization would lead to a reduction in producer prices of multinational firms and higher profits. This creates incentives for more firms to organize as MNEs. Finally, if the share of multinational firms increases when trade costs decline, it is even possible that
\( \rho \) remains constant or slightly increases for a certain range of trade costs (dotted line). Here, the countervailing effect of an increasing share of multinational firms at higher trade freeness is strong enough to prevent a decline in \( \rho \).\textsuperscript{14}

4 Stylized facts and discussion

The novel implication of this model is the crucial role of technology for the attractiveness of horizontal FDI. The theoretical section has highlighted that industries requiring a relatively higher share of inputs supplied and directly controlled by the management should have a greater incentive to choose a multinational firm organization compared to industries that depend more on component inputs.

To capture the technology parameter, I followed the literature in choosing capital intensity (measured as capital stock over employment) as a proxy for the importance of management-controlled inputs.\textsuperscript{15} Skill-intensity (measured as payroll over employment) is used as an alternative proxy in the literature and establishes the same insights. Both variables can be computed on the industry level from the NBER’s Manufacturing Industry Productivity Database. Further, and less straightforwardly, we need a measure of affiliate sales relative to total sales in a given foreign market – as described by \( \rho \) in Figure 3. As the theory focused on horizontal FDI, it is crucial to disentangle this mechanism from the vertical motive to setting up affiliated plants abroad. However, this is not easy to do as Alfaro and Charlton (2009) among others have pointed out. Based on industry-level data, a reasonable approach to shed light on the matter is to take local sales of foreign affiliated plants abroad to non-affiliated parties to capture final sales in the foreign market. The Bureau of Economic Analysis (BEA) provides public access to such data of US-based and majority-owned multinational corporations. With regard to US exports, I take industry-level data from the US International Trade Commission and subtract intra-firm exports reported by the BEA to reduce the noise of vertical motives for FDI.

\textsuperscript{14}It is straightforward to derive closed-form solutions of the model. As they are not of major importance for this analysis, they are relegated to Appendix B.

\textsuperscript{15}See Antràs (2003) and the empirical work discussed in the introduction.
According to data availability and the BEA industry classification, we get data for 30 manufacturing industries for the period 1999-2005 (see Appendix C for details).

Figure 4 illustrates substantial variation in the share of affiliate sales relative to total global sales pointing to a positive link to the importance of management inputs – which is in line with the prediction of the theoretical model. The (unconditional) regression coefficient is estimated at 0.19 with a t-value of 4.95. In contrast to this paper, previous research is unable to explain this pattern of industry-level FDI. For example, Eckel and Egger (2009) stress the role of unions in a heterogeneous-firms model with co-existence of exporters and MNEs building on a similar idea that FDI affects the bargaining power. In their analysis, the fall-back profits increase through foreign direct investment causing lower negotiated wages for multinational firms compared to exporters. This cost-saving effect provides an additional incentive for setting up a foreign affiliate and can dominate the trade-cost-saving effect of choosing exporting. Lommerud, Meland and Sørgard (2003) argue that foreign direct investment helps avoiding higher union wages giving rise to a novel determinant for serving the foreign market locally. Neary (2009) points out that intra-regional trade liberalization would attract export-platform FDI to serve all countries in the region.
from one location. Similarly, there is a case for trade liberalization to stimulate cross-border mergers and acquisitions.

Although Figure 4 reveals an interesting pattern of industry-level FDI, it is apparent that these stylized facts are unable to provide sound evidence for the hypothesized economic mechanism. To provide such evidence, it would be necessary to exploit firm-level data, ideally using product information to identify whether a good constitutes a final sale for a firm (that could be a final consumer or another firm). Further, it would be interesting to study the role of distance (trade costs) in combination with industry-level input intensity to test another prediction of the model. Such an analysis is beyond the scope of this paper due to data limitations.

5 Concluding remarks

This paper has addressed the role of incomplete contracts for the mode of foreign market entry. I have argued that incomplete contracts serve as a novel determinant for foreign direct investment. Depending on industry technology, this channel may favor or disfavor foreign direct investment compared to exporting. In industries where inputs provided by the central management unit are important, setting up affiliated plants abroad to serve customers locally is stimulated through incomplete contracts as the higher outside option in the intra-firm bargaining raises firm profits. The opposite is true when management inputs are less important. This gives rise to an industry-pattern that implies a higher share of affiliate sales relative to total sales in a given market in the former type of industries – independently from distance. Nevertheless, trade liberalization could be identified as a magnifier of the gap in affiliate sales shares across industries. The described industry-pattern of foreign direct investment is in line with stylized facts for US exports and affiliate sales. Finally, the paper established incomplete contracts as a novel mechanism to reason that horizontal foreign direct investment may increase even when trade costs fall – a finding that is at odds with the well-known proximity-concentration trade-off.

While this paper should be regarded as a complement to the incomplete-contracts
literature on the sourcing decision of firms, it may be worthwhile to merge the vertical with the horizontal dimensions of firm organization in future research. This might generate novel insights on the interrelations between the two dimensions (see Yeaple, 2003, for a complete-contracting model of complementarities between vertical and horizontal FDI). With respect to empirical research, more work is needed to identify a causal effect of incomplete contracts on the exports-versus-FDI decision of firms. To do this, it is inevitable to exploit product information on the firm level to identify final sales to unaffiliated parties. This is crucial to disentangle the vertical from the horizontal motive to engage in FDI.

Appendix

A Derivation of optimal supply levels \( h \) and \( q \)

Combining the inverse demand function with the production function (3), we get revenues

\[
 r_l(\varphi) = \varphi^\alpha \left( \frac{h_l}{\eta} \right)^{\alpha \eta} \left( \frac{q_l}{1 - \eta} \right)^{\alpha (1 - \eta)} \left( \frac{\gamma E}{P} \right)^{1 - \alpha}
\]

Solving \( \partial (\beta_l r_l(\varphi) - h_l) / \partial h_l = 0 \) and \( \partial ((1 - \beta_l) r_l(\varphi) - q_l) / \partial q_l = 0 \), we get

\[
 \frac{h_l}{\eta} = \alpha^{\frac{1}{1 - \alpha}} (\beta_l)^{\frac{1 - \alpha}{1 - \alpha}} (1 - \beta_l)^{\frac{\alpha (1 - \eta)}{1 - \alpha}} \frac{\gamma E}{P} \varphi^\frac{\alpha}{1 - \alpha}
\]

\[
 \frac{q_l}{1 - \eta} = \alpha^{\frac{1}{1 - \alpha}} (\beta_l)^{\frac{\alpha}{1 - \alpha}} (1 - \beta_l)^{\frac{1 - \alpha}{1 - \alpha}} \frac{\gamma E}{P} \varphi^\frac{\alpha}{1 - \alpha}
\]

Using these insights, we can compute operating profits \( r_l - h_l - q_l \) and finally obtain the profit functions as given in (5).
B Cutoff productivities and the number of firms

In this Appendix, I close the model and derive the productivity cutoffs of exporters and multinational firms as well as the equilibrium number of operating firms in sector \( X \). For this, it is useful to derive the productivity level of the average firm in the market. Average productivity is derived to meet \( P = 2M p_e (\bar{\varphi})^{1-\varepsilon} \). The price index is given by

\[
P = N (1 + \phi) \int_{\varphi^*_e}^{\varphi^*_m} p_e (\varphi)^{1-\varepsilon} dG (\varphi) + 2N \left( \frac{\beta^m (1 - \beta^m)^{1-\eta}}{\beta^e (1 - \beta^e)^{1-\eta}} \right)^{\varepsilon-1} \int_{\varphi^*_e}^{\infty} p_e (\varphi)^{1-\varepsilon} dG (\varphi)
\]

Using \( p_e (\varphi) = (\bar{\varphi}/\varphi) p_e (\bar{\varphi}) \) together with \( N = M/[1 - G (\varphi^*_e)] \) and the Pareto parametrization yields

\[
\bar{\varphi} = \left[ \frac{k}{2(k - \varepsilon + 1)} \right]^{\frac{1}{\varepsilon-1}} \\
\left\{ (1 + \phi) + \left[ 2 \left( \frac{\beta^m (1 - \beta^m)^{1-\eta}}{\beta^e (1 - \beta^e)^{1-\eta}} \right)^{\varepsilon-1} - (1 + \phi) \right] \mu \left( \frac{\varphi^*_m}{\varphi^*_e} \right)^{\varepsilon-1} \right\}^{\frac{1}{\varepsilon-1}} \varphi^*_e
\]

to meet the initial definition of the price index. In a final step, we make use of the cutoff productivities \( \varphi^*_e \) and \( \varphi^*_m \) obtained from solving \( \pi (\varphi^*_e) = 0 \) and \( \Delta \pi (\varphi^*_m) = 0 \) to get

\[
\bar{\varphi} = \left[ \frac{(1 + \phi) k}{2(k - \varepsilon + 1)} \left( 1 + \mu \delta \frac{f_m}{f} \right) \right]^{\frac{1}{\varepsilon-1}} \varphi^*_e
\]

(B.1)

where

\[
\delta = \frac{2 \left( \frac{\beta^m (1 - \beta^m)^{1-\eta}}{\beta^e (1 - \beta^e)^{1-\eta}} \right)^{\varepsilon-1} - (1 + \phi)}{2\Omega - (1 + \phi)}
\]

Using \( r_e (\bar{\varphi}) = (\bar{\varphi}/\varphi^*_e)^{\varepsilon-1} r_e (\varphi^*_e) \) together with the zero profit condition of the
marginal exporting firm yields revenues of the average firm as

$$r_e (\tilde{\varphi}) = \frac{(1 + \phi) k}{2 (k - \varepsilon + 1)} \frac{f + \mu \delta f_m}{1 - \tilde{\alpha}_e}.$$  

Aggregate expenditures consist of labor income $L$ and aggregate profits

$$\Pi = M [ (1 - \tilde{\alpha}_e) r_e (\tilde{\varphi}) - (f + \mu f_m)]$$

$$= M \left[ \frac{k (1 + \phi) (f + \mu \delta f_m)}{2 (k - \varepsilon + 1)} - (f + \mu f_m) \right].$$

Noting that $\gamma E = \gamma (\Pi + L) = 2 M r_e (\tilde{\varphi})$, the number of firms obtains as

$$M = \frac{(k - \varepsilon + 1) \gamma L}{(1 + \phi) k \left( \frac{1}{1 - \tilde{\alpha}_e} - \frac{3}{2} \right) (f + \mu \delta f_m) + (k - \varepsilon + 1) \gamma (f + \mu f_m)}.$$

Plugging $M$ into $\varphi^*_e = (M/N)^{-1/k}$ delivers the productivity cutoff for exporting firms which in turn can be used in (B.1) to obtain the productivity of the average firm.

Finally, indirect utility can be expressed as

$$V = \gamma \gamma (1 - \gamma)^{1-\gamma} P^{\gamma \gamma} E \frac{E}{L}.$$  

It turns out that welfare is strictly increasing in the trade freeness measure $\phi$, but on a lower level if contracts are incomplete compared to a frictionless world. Furthermore, the welfare level decreases the further $\beta$ deviates from the profit-maximizing bargaining weight $\beta^*$.  

C Data sources and industry classification

US industry-level exports are taken from the US International Trade Commission, reported for the 4-digit NAICS classification. The Bureau of Economic Analysis uses International Surveys Industry (ISI) categories that are also based on NAICS.
since 1997. Table C.1 provides an overview which NAICS industries feed into the BEA aggregates. These data are matched with local foreign sales by affiliates and industry of the US parent to unaffiliated persons, following the same BEA categories.

<table>
<thead>
<tr>
<th>BEA industry</th>
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<tbody>
<tr>
<td>Food</td>
<td>3111-3119</td>
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<tr>
<td>Beverages and tobacco products</td>
<td>3121-3122</td>
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<tr>
<td>Textiles, apparel, and leather products</td>
<td>3130-3160</td>
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<td>Wood products</td>
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<td>Paper</td>
<td>3221-3222</td>
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<tr>
<td>Printing and related support activities</td>
<td>3231</td>
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<tr>
<td>Petroleum and coal products</td>
<td>3242-3244</td>
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<tr>
<td>Basic chemicals</td>
<td>3251</td>
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<tr>
<td>Resins and synthetic rubber, fibers and filaments</td>
<td>3252</td>
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<tr>
<td>Pharmaceuticals and medicines</td>
<td>3254</td>
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<tr>
<td>Soap, cleaning compounds, and toilet preparations</td>
<td>3256</td>
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<tr>
<td>Other chemicals</td>
<td>3253, 3255 and 3259</td>
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<td>Plastics and rubber products</td>
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<td>Primary metals</td>
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<td>Electrical equipment, appliances, and components</td>
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<tr>
<td>Motor vehicles, bodies and trailers, and parts</td>
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<td>Furniture and related products</td>
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<tr>
<td>Miscellaneous manufacturing</td>
<td>3391, 3399</td>
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References


Carluccio, J. and T. Fally (2010), Global sourcing under imperfect capital markets, *mimeo*, University of Colorado at Boulder.


