

International Outsourcing and Imperfect Contract Enforcement

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Abstract

This paper examines the make-or-buy decision with regard to location (North and South) and productivity (firm heterogeneity) in a complete contracting model. In contrast to the usual incomplete contracting approach to outsourcing, this paper considers the situation in which outsourcing can be governed by contracts, although contract enforcement is imperfect. It shows that a firm's productivity and regional differences in wage rates, fixed costs for vertical integration, fixed costs for outsourcing and degrees of contract enforcement jointly determine whether the firm will choose vertical integration or outsourcing, and whether they will locate in the North or the South.

JEL Classification: F12, F14, F23

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1. Introduction

We are now living in an economically globalized world. One important feature of globalization is the rapid expansion of multinational companies. While the world's GDP increased by about 173% between 1983 and 2001, the economic power of multinationals strengthened much more than that. The value of capital assets owned by the world's 50 largest corporations (most of them are multinationals) increased by an astonishing 686% during the same period of time (Chandler and Mazlish, 2005). With trade liberalization and falling transportation costs, firms increasingly look abroad not only for new markets but also for low-cost production opportunities.

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Multinationals take advantage of low-cost foreign inputs and gain a competitive advantage over less mobile firms that remain dependent on high-cost inputs from developed countries.

While multinationals can produce intermediate goods in developing countries via foreign direct investment (FDI), there are more and more firms obtaining these inputs through contracts with external suppliers abroad. For example, not a single employee of Nike actually makes shoes. All of Nike's shoes and clothing are manufactured by foreign firms under subcontracts with Nike, mostly in China, Indonesia and Vietnam.

Some recent papers have started to address issues that arise from international outsourcing and vertical integration. Antràs and Helpman (2004) develop a global sourcing model that combines the within-sector firm heterogeneity framework of Melitz (2003) and the incomplete contracting approach of Grossman and Hart (1986). Following Antràs (2003), they include in their model a feature that distinguishes it from models in the incomplete contracting literature; that is, in their model, the friction of incomplete contracts also exists within integrated firms.

For each product variety, the final-good producer controls the supply of headquarter services, while a supplier, inside or outside the firm, controls intermediate goods. Antràs and Helpman (2004) investigate the impact of variations in productivity within sectors and that of differences in technological and organizational characteristics across sectors on international trade, FDI, and the organizational choices of the firms. They characterize the equilibrium in which multinationals with different productivity levels choose different ownership structures and supplier locations.

A key result is that high-productivity firms acquire intermediate inputs in the South whereas low-productivity firms acquire them in the North.

In the international outsourcing literature, all studies that focus on the choice between making (vertical integration) or buying (outsourcing), e.g., Grossman and Helpman (2002) and Antràs and Helpman (2004), assume that firms face the friction of incomplete contracts.¹ In contrast, the present paper follows Qiu (2006) to assume that the final-good producer and the intermediate-good supplier can sign a complete contract. However, the contract may be breached and contract enforcement is not perfect. In such an environment, the optimal organizational form and location of the intermediate-good suppliers are analyzed.

Is the complete-contracting approach realistic? Dunning and Narula (2004) report that in the process of globalization, with the development of communication technologies and improvements in the commercial environments in developing countries, the enforceability of cross-border contracts has been improved, which makes it easier for firms in the North to establish contractual relationship with small and medium enterprises (SMEs) in the South. Although multinationals usually do not have ownership in those SMEs, they can monitor the production process in the SMEs and exert a profound influence on quality control, accounting and procurement. They are able to specify their products and services in detail.

It is inevitable that contracts may be breached for various reasons. Cheng, Moser, and Wang (2000) document a large number of arbitration cases in China with regard

¹ See recent surveys such as Helpman (2006) and Spencer (2005).

to disputes arising from processing and assembly activities. Processing and assembly arrangements are among the most common modes of Sino-foreign business cooperation. In a typical processing and assembly arrangement, a Chinese company processes raw materials or assembles parts and components in accordance with the foreign firm's specifications; the finished products are delivered to the foreign party; and the Chinese company receives the processing and assembly fees. Generally speaking, the Chinese party does not have its independent brand nor a distribution channel in the international market, and so it has much less bargaining power vis-à-vis the foreign party during the negotiation of contracts. It is observed that sometimes the foreign party does not fulfill its obligations specified in the contract. For example, when it faces difficulties in selling its products, the foreign firm unilaterally terminates the contract, not paying the Chinese party for the finished products.

Although incomplete contracting is still a very important issue faced by firms when they make the make-or-buy decision, the above observation inspires us to examine the international outsourcing issues under the framework of complete contracting with imperfect contract enforcement. In fact, in his general equilibrium analysis of software development, Qiu (2006) studied the effect of contract enforcement on the organizational mode of customized software development, i.e., whether the software is developed in-house by the software users or obtained through outsourcing. In his model, contracts between a programmer and a customer are complete but contract enforcement is imperfect. He indicates that the model can be easily extended to analyzing international trade of software. Moreover, Qiu's approach is not limited to analyzing customized software development. The present paper incorporates Qiu's complete-contract-imperfect-contract-enforcement approach to the North-South heterogeneous firm outsourcing framework of Antràs and Helpman (2004). Specifically, a multinational firm in the North controls the provision of headquarter services and finds its intermediate input supplier in the North or the South. The firm chooses between two organizational modes. In the case of vertical integration, the firm has the input supplier in its corporation. In the case of outsourcing, the firm creates a contractual relationship with a manufacturing plant outside its corporation. The contract is complete and needs no renegotiation after the intermediate goods have been produced and delivered to the final-good producer. However, the contract might be breached and the contract enforcement of the contract is imperfect in both regions.

The firm's optimal decision is investigated with regard to the organizational mode and location of the intermediate good production. It will be shown that the firm's production efficiency and the regional differences in the fixed costs of management, the fixed costs of contracting, the wage rates and the degree of contract enforcement are all important in shaping the equilibrium. Typically, firms with lower productivity tend to source (insource or outsource) in the North and firms with higher productivity tend to source in the South; firms with lower productivity tend to honor their contracts and firms with higher productivity tend to breach their contracts; firms with lower productivity tend to use outsourcing and firms with higher productivity tend to use vertical integration. The degree of contract enforcement in the South and other factors mentioned above affect the productivity levels that separate different decisions.

Why is the complete-contract-imperfect-enforcement approach needed? First, as argued before, it captures some phenomena of the real world, which is not adequately

represented by incomplete contracts. Second, and more importantly, the complete contract approach allows some interesting results to be derived which would not be obtained using the incomplete contract approach. For example, the complete contract approach has the potential to explain why disputes occur, predict what types of contracts will be breached, and show how improving enforcement in one region affect the contracting and outsourcing behavior in both regions.

The model is developed in Section 2. In Section 3, the equilibrium is analyzed. In the concluding section, the model's assumptions and results are discussed.

2. Model

Following Antràs and Helpman (2004), this study considers a world that consists of two countries, the North and the South. There is only one production factor, labor, which is used to produce the intermediate goods and the final goods. The final goods are sold in the integrated world market in which consumers have the following utility function

$$U = x_0 + \frac{1}{\mu} \sum X_j^\mu, \quad 0 < \mu < 1,$$

where x_0 stands for the consumption of a homogeneous good, X_j is the aggregate consumption of the differentiated products in sector j , and μ is a parameter. The aggregate consumption in sector j is a CES function of the consumption of different varieties $x_j(i)$:

$$X_j = \left[\int x_j(i)^\alpha di \right]^{1/\alpha}, \quad 0 < \alpha < 1.$$

The range of i will be endogenously determined. Assume that $\alpha > \mu$; that is, varieties from within a sector are more substitutable for each other than are those from different sectors. The resulting inverse demand function for each variety in sector j is

$$p_j(i) = X_j^{\mu-\alpha} x_j(i)^{\alpha-1}.$$

It is also assumed that producers of differentiated products face a perfectly elastic supply of labor in both regions. Let w^N denote the wage rate in the North and w^S denote the wage rate in the South and assume that $w^N > w^S$. Only the North knows how to produce the final-good varieties. To start producing a variety, i , a firm (a final good producer in the North) needs to bear a fixed cost of entry, $w^N f^E$. Upon paying the fixed cost, the firm draws productivity, θ , from a known distribution, $G(\theta)$. Then it decides whether to exit or start producing. In the latter case, an additional fixed cost of managing production has to be incurred, which is a function of the organizational mode and the location of the intermediate input production.

To produce any final-good variety, two variety-specific inputs are required: headquarter services, $h_j(i)$, and manufactured components, $m_j(i)$. These inputs are combined in a sector-specific Cobb-Douglas function to generate the output,

$$x_j(i) = \tilde{\theta} \left[\frac{h_j(i)}{\eta_j} \right]^{\eta_j} \left[\frac{m_j(i)}{1 - \eta_j} \right]^{1 - \eta_j}, \quad 0 < \eta_j < 1,$$

where the productivity, $\tilde{\theta}$, is firm-specific and the parameter, η_j , is sector-specific. The larger η_j is, the more intensive the sector is in using headquarter services. Headquarter services can only be produced in the North, with one unit of labor per unit of output. Intermediate inputs can be produced in the North and in the South, with one unit of labor per unit of output.

Two types of agents engage in production: final-good producers (also called the firms), H, who supply headquarter services, and intermediate input suppliers, M. There are two ways to organize production. First, H can own M, in the North or in the South, which corresponds to vertical integration. Alternatively, H can sign a contract with M, in the North or in the South, to supply the input, which corresponds to outsourcing. H has to incur a fixed cost for organizing such production (e.g., supervision and management in the case of vertical integration, searching and contracting in the case of outsourcing). These organizational costs depend on the ownership type and the location of M. Denote the organization cost as $w^N f_k^l$, where k stands for the organizational mode (V for vertical integration, and O for outsourcing) and l stands for location (N for the North, and S for the South). Following Antràs and Helpman (2004), it is assumed that

$$f_V^S > f_O^S > f_V^N > f_O^N. \tag{1}$$

Outsourcing is governed by complete contracts. Specifically, H and M can sign a contract that stipulates the purchase of specialized intermediate input at a certain price. It is assumed that the precise nature of the required input can be described in the contract and verified by the court. H chooses the organizational mode and the location of M to maximize its profits.

3. Analysis

First to be analyzed is the location choice given that vertical integration is the chosen organizational mode of the firms. Then, the paper will focus on outsourcing by assuming that vertical integration is not an option. Finally, the paper will derive equilibrium decisions of the firms when they can choose the organizational mode and location of the intermediate good production. The following analysis focuses on a particular sector and so j can be dropped from all the variables.

3.1. Vertical Integration

Suppose that H chooses vertical integration in region l . Its revenue from the sale of the final goods would be

$$R(i) = X^{\mu - \alpha} \tilde{\theta}^\alpha \left[\frac{h(i)}{\eta} \right]^{\alpha \eta} \left[\frac{m(i)}{1 - \eta} \right]^{\alpha(1 - \eta)}.$$

Thus, H's profit is

$$\pi_V^l = R(i) - w^N h(i) - w^l m(i) - w^N f_V^l. \tag{2}$$

Denote $\theta \equiv \tilde{\theta}^{\frac{\alpha}{1-\alpha}}$. This transformation will not alter the upper and lower bounds of the productivity variable. H chooses $h(i)$ and $m(i)$ to maximize the above profit. The optimal profit, derived in the Appendix, is equal to

$$\pi_V^l = \pi(\theta) \left(w^l \right)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - w^N f_V^l,$$

where

$$\pi(\theta) \equiv \alpha^{\frac{\alpha}{1-\alpha}} (1 - \alpha) X^{\frac{\mu-\alpha}{1-\alpha}} \theta (w^N)^{\frac{-\alpha\eta}{1-\alpha}}. \tag{3}$$

In choosing between vertical integration in the North and vertical integration in the South, H trades off the lower variable cost of manufacturing the intermediate good in the South against the lower fixed management cost in the North. Depending on whether the cross-country difference in wage rates is small or large relative to the cross-country difference in fixed management costs, the resulting equilibrium can have vertical integration in both countries or only in the South.

Figure 1: Vertical integration in both regions

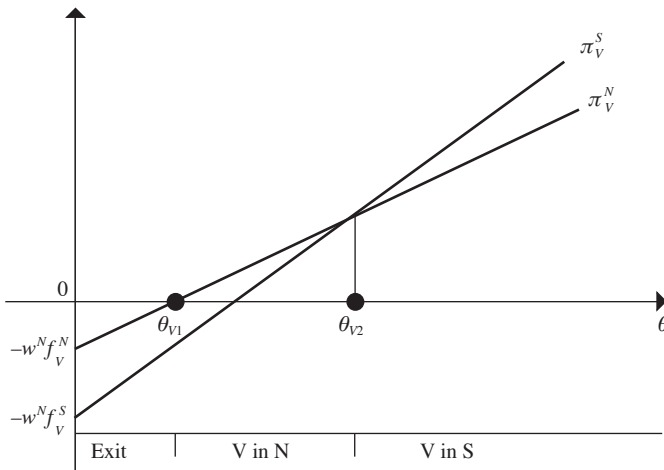


Figure 1 depicts the case in which the wage differential is small relative to the fixed-cost differential. Firms with productivity below θ_{V1} expect negative profits whether manufacturing the intermediate good internally in the North or in the South and so they exit the market. Firms with productivity between θ_{V1} and θ_{V2} will choose vertical integration in the North. Firms with productivity above θ_{V2} will choose vertical integration in the South. Letting $\pi_V^N = 0$ gives

$$\theta_{V1} = \frac{1}{\alpha} (1 - \alpha)^{-\frac{(1-\alpha)}{\alpha}} X^{\frac{\alpha-\mu}{\alpha}} (w^N)^{\frac{1}{\alpha}} (f_V^N)^{\frac{1-\alpha}{\alpha}} . \tag{4}$$

Letting $\pi_V^N = \pi_V^S$ gives

$$\theta_{V2} = \frac{1}{\alpha} (1 - \alpha)^{-\frac{(1-\alpha)}{\alpha}} X^{\frac{\alpha-\mu}{\alpha}} \left\{ \frac{w^N (f_V^S - f_V^N)}{(w^N)^{\frac{-\alpha\eta}{1-\alpha}} \left[(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}} \right]} \right\}^{\frac{1-\alpha}{\alpha}} . \tag{5}$$

Figure 2: Vertical integration in the South only

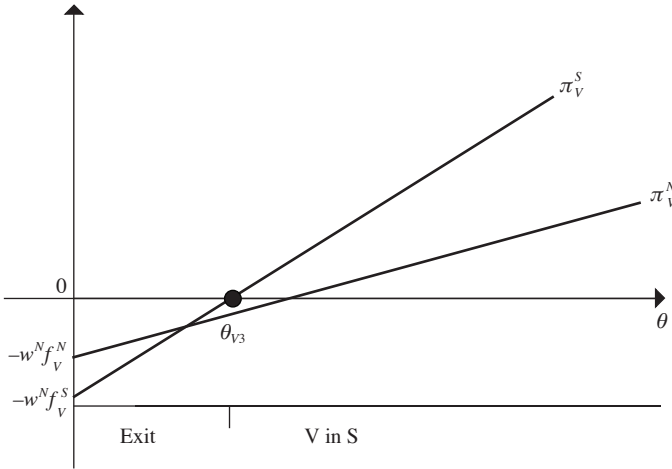


Figure 2 depicts the case in which the wage differential is relatively large such that the two profit lines intersect at a negative profit level. In this case, $\theta_{V2} < \theta_{V1}$, that is,

$$\frac{w^N (f_V^S - f_V^N)}{(w^N)^{\frac{-\alpha\eta}{1-\alpha}} \left[(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}} \right]} < (w^N)^{\frac{1}{1-\alpha}} f_V^N ,$$

implying that the wage differential is large enough compared with the fixed cost difference:

$$\frac{w^N}{w^S} > \left(\frac{f_V^S}{f_V^N} \right)^{\frac{1-\alpha}{\alpha(1-\eta)}}$$

Letting $\pi_V^S = 0$ gives

$$\theta_{V3} = \frac{1}{\alpha} (1 - \alpha)^{-\frac{(1-\alpha)}{\alpha}} X^{\frac{\alpha-\mu}{\alpha}} (w^N)^\eta (w^S)^{1-\eta} (w^N)^{\frac{1-\alpha}{\alpha}} (f_V^S)^{\frac{1-\alpha}{\alpha}} .$$

Firms with productivity above θ_{V3} will choose vertical integration in the South whereas firms with productivity lower than θ_{V3} will exit.

The rest of the paper focuses on the case as depicted in Figure 1 for two reasons. First, many cases are analyzed in the outsourcing option (next subsection), which is the main focus of this paper. Second, the implication of Figure 2 on the final equilibrium will become straightforward once the equilibrium based on Figure 1 has been derived.

Referring to Figure 1, the free-entry condition entails that

$$\int_{\theta_{V1}}^{\theta_{V2}} \pi_V^N dG(\theta) + \int_{\theta_{V2}}^{\infty} \pi_V^S dG(\theta) = w^N f_E.$$

From (3), it is shown that

$$w^N f_E = \pi(\theta)\theta^{-1} \left[(w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}} \int_{\theta_{V1}}^{\theta_{V2}} \theta dG(\theta) + (w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} \int_{\theta_{V2}}^{\infty} \theta dG(\theta) \right] - w^N \left[f_V^N \int_{\theta_{V1}}^{\theta_{V2}} dG(\theta) + f_V^S \int_{\theta_{V2}}^{\infty} dG(\theta) \right],$$

and the aggregate consumption index, X , satisfies

$$w^N X^{\frac{\alpha-\mu}{1-\alpha}} = \frac{\alpha^{\frac{\alpha}{1-\alpha}} (1-\alpha)(w^N)^{\frac{-\alpha\eta}{1-\alpha}} \left\{ (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}} [V(\theta_{12}) - V(\theta_{V1})] + (w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} [V(\theta_{\infty}) - V(\theta_{V2})] \right\}}{f_E + f_V^N [G(\theta_{V2}) - G(\theta_{V1})] + f_V^S [G(\theta_{\infty}) - G(\theta_{V2})]}, \tag{6}$$

where $V(\theta) = \int_0^{\theta} \theta dG(\theta)$.

Equations (4), (5) and (6) provide implicit solutions for the cutoffs, θ_{V1} and θ_{V2} , and for the aggregate consumption index, X . In the rest of the paper, graphs are used for the basic analysis in the text and the mathematical expressions of the cutoff points are provided in the Appendix.

3.2. Outsourcing by Contracts

In this subsection, outsourcing by contracts is considered, supposing that vertical integration is not an option. A contract between H and M specifies the quantity of the intermediate good to be delivered by M to H and the fee that H pays to M. The intermediate good is a product-specific input to H and therefore it has no use in the production of other final products. A contract may be breached by H, in which case, M has already produced and delivered the intermediate input, but H does not pay the contracted fee. Following Qiu (2006), it is assumed that the contract laws are not perfectly enforced. Specifically, in region l , for any contract in default, there is probability e^l that the contract

will be enforced by the court. When the court enforces a defaulted contract, H must pay M the contracted fee. In addition, H bears an additional cost, $t > 0$, which may consist of both monetary and non-monetary losses. However, M does not receive t . It is assumed that t does not vary across firms and across regions. The implications of relaxing this assumption are discussed in the concluding section. When a defaulted contract is not enforced by the court, H pays nothing to M. The two parameters, e^l and t , jointly represent the degree of contract enforcement in region l .

Suppose that a contract is offered by H to M based on a take-it-or-leave-it attitude. Although some Hs may find it optimal not to breach contracts, the intermediate good suppliers do not know the identities of the Hs and therefore expect that their contracts will be breached. Given that there will be many potential Ms, the optimal contract fee should make M indifferent to signing the contract or not, i.e., getting zero expected profits. Thus, with the probability, e^l , of being repaid (ordered by the court), the contract fee specified by variety- i producer for the contracted amount, $m(i)$, should be $w^l m(i)/e^l$.

If H has a contract with $m(i)$ and breaches the contract, its (expected) profit will be (subscript B for breaching)

$$\pi_B^l = R(i) - w^N h(i) - e^l(w^l m(i)/e^l + t) - w^N f_O^l.$$

Similar to the derivation of optimal profit in the integration case, it can be shown that the optimal profit is

$$\pi_B^l = \pi(\theta) (w^l)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - e^l t - w^N f_O^l. \tag{7}$$

If H honors its contract, its profit is (subscript H for honoring)

$$\pi_H^l = R(i) - w^N h(i) - w^l m(i)/e^l - w^N f_O^l.$$

As shown in the Appendix (with a slight amendment), the optimal profit is

$$\pi_H^l = \pi(\theta) (w^l)^{\frac{-\alpha(1-\eta)}{1-\alpha}} (e^l)^{\frac{\alpha(1-\eta)}{1-\alpha}} - w^N f_O^l. \tag{8}$$

By comparison, $\pi_H^l \geq \pi_B^l$ if and only if

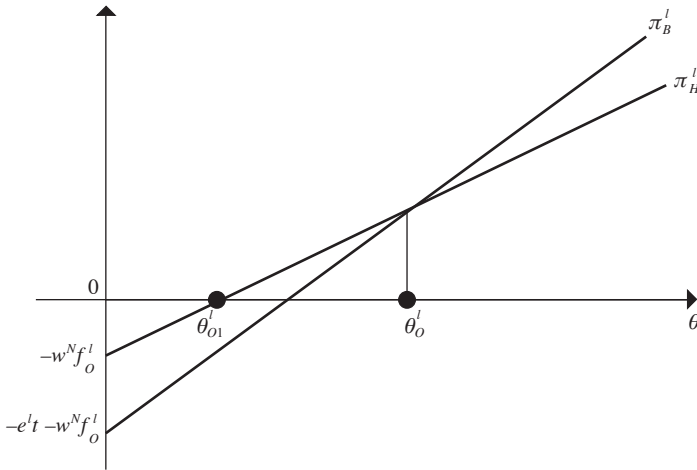
$$\frac{e^l t (w^l)^{\frac{\alpha(1-\eta)}{1-\alpha}}}{1 - (e^l)^{\frac{\alpha(1-\eta)}{1-\alpha}}} \geq \pi(\theta). \tag{9}$$

The LHS of (9) increases in both e^l and t , capturing the degree of contract enforcement. With stronger contract enforcement, it is more likely that the profit derived from honoring a contract is larger than that from breaching a contract. However, the RHS of (9) is increasing in θ . Thus, for given e^l and t , condition (9) holds for small θ but does not hold for large θ . Let θ_O^l be the critical level such that (9) holds as an equality. Then, firms with $\theta \leq \theta_O^l$ will not breach their contracts in region l and will obtain profit π_H^l , while firms

with $\theta > \theta_o^l$ will breach their contracts in region l and will obtain profit π_B^l . Note that θ_o^l increases as contract enforcement becomes stronger.

Condition (9) also implies that the low wage region induces more contract breaching, *ceteris paribus*. That is, if the two regions have the same degree of contract enforcement ($e^S = e^N$), while firms (with low θ) never breach contracts in both regions and some (with high θ) always breach contracts in both regions, there exist some firms (with intermediate θ) that will honor contracts in the North but breach contracts in the South.

Figure 3: Contracts and enforcement



In Figure 3, $\pi_H^l = 0$ at θ_{o1}^l . Given that the firms outsource in region l , firms with $\theta \in [\theta_{o1}^l, \theta_o^l]$ will not breach contracts, and firms with $\theta > \theta_o^l$ will breach contracts. However, if contract enforcement is weak, then $\pi_H^l(\theta_o^l) < 0$, in which case, $\theta_{o1}^l > \theta_o^l$. All contracts will be breached.

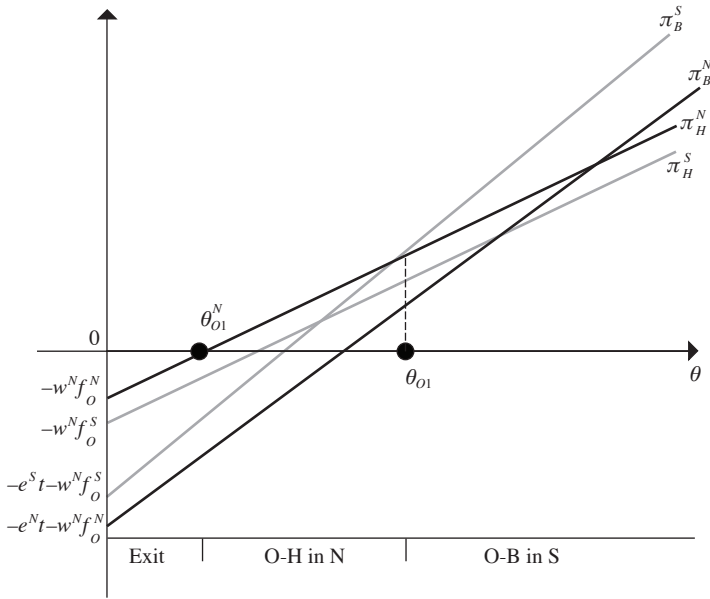
Next, the outsourcing decisions in both regions will be analyzed.

- **Weak contract enforcement in the South**

Suppose that the contract enforcement in the South is very weak:

$$e^S < e^N - t^{-l}(f_o^S - f_o^N)w^N. \tag{10}$$

Figure 4: Very weak contract enforcement in the South



This condition is equivalent to $e^S t + w^N f_0^S < e^N t + w^N f_0^N$. It is clear that weak enforcement is a relative term: the expected cost of breaching a contract in the South ($e^S t$) plus the fixed entry cost to the South is lower than the expected cost of breaching a contract in the North ($e^N t$) plus the fixed entry cost to the North. Under condition (10), in Figure 4, the four profit lines are drawn in relation to the productivity level. Note that π_B^S is steeper than π_B^N , but π_H^S may or may not be steeper than π_H^N , depending on e^S relative to e^N . For very small e^S , π_H^S is flatter. In this case, firms with $\theta < \theta_{01}^N$ exit, firms with $\theta \in [\theta_{01}^N, \theta_{01}]$ choose outsourcing in the North and will honor their contracts (denoted as O-H in N), and firms with $\theta > \theta_{01}$ choose outsourcing in the South and breach their contracts (denoted as O-B in S).

Figure 5 shows another possibility in which e^S is not too small. As a result, π_H^S is much steeper than π_H^N . Then, firms with $\theta < \theta_{01}^N$ exit, firms with $\theta \in [\theta_{01}^N, \theta_{02}]$ choose O-H in N, firms with $\theta \in [\theta_{02}, \theta_{S0}]$ choose outsourcing in the South and honor their contracts (denoted as O-H in S), and firms with $\theta > \theta_{S0}^S$ choose O-B in S.

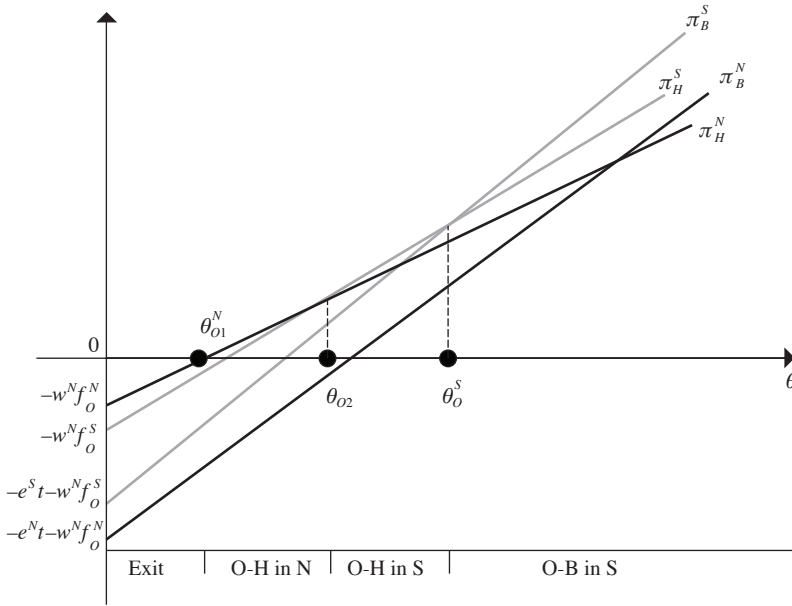
By comparing Figure 4 with Figure 5, it is shown that strengthening contract enforcement in the South results in more outsourcing in the South and more contracts being honored in the South.

• Strong contract enforcement in the South

Suppose that $e^N t + w^N f_0^N \leq e^S t + w^N f_0^S$; that is, the contract enforcement in the South is strong in the sense that (10) does not hold. Note that π_B^S is steeper than π_B^N . Also note that π_H^S is steeper than π_H^N , because e^S is quite large now. Figure 6 can now be produced. Firms with $\theta < \theta_{01}^N$ exit, firms with $\theta \in [\theta_{01}^N, \theta_{03}]$ choose O-H in N, firms with

$\theta \in (\theta_{03}, \theta_{04}]$ choose O-H in S, firms with $\theta \in (\theta_{04}, \theta_{05}]$ choose outsourcing in the North and breach contracts (denoted as O-B in N), and firms with $\theta > \theta_{05}$ choose O-B in S.

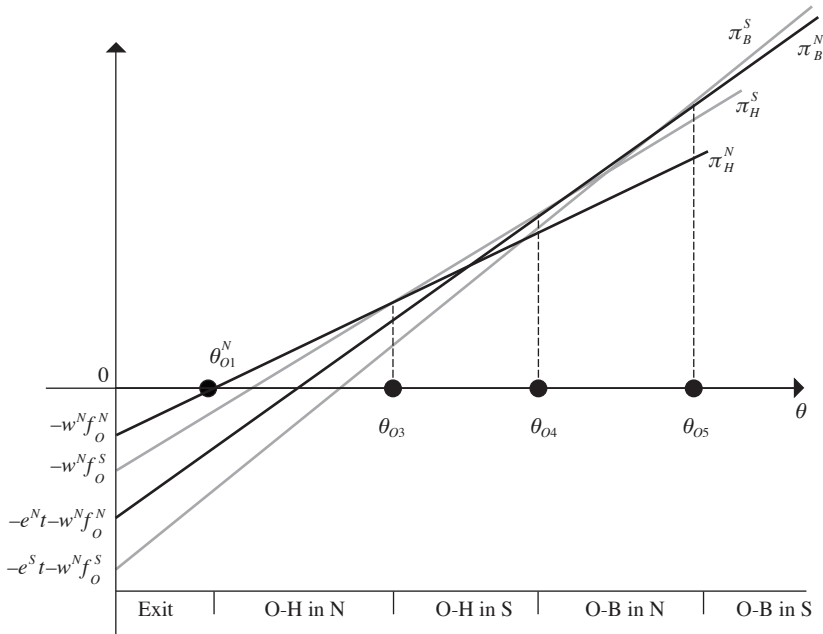
Figure 5: Not very weak contract enforcement in the South



• **Summary**

When outsourcing is governed by contracts, contract enforcement is very crucial to the firms' outsourcing decisions and contracting behaviors. The analysis in this subsection (based on Figures 4 to 6) shows that (i) low- θ firms choose O-H in N and very high- θ firms always choose O-B in S; (ii) when contract enforcement in the South switches from very weak to not too weak, some intermediate level- θ firms choose O-H in S; and (iii) when contract enforcement in the South becomes strong, some high- θ firms switch from O-B in S to O-B in N. In general, strengthening contract enforcement in the South discourages contract breaching in this region, but total outsourcing in this region may or may not increase. In contrast, strengthening contract enforcement in the South sometimes results in more contract breaching in the North as the contract breaching firms switch outsourcing from the South to the North.

Figure 6: Strong contract enforcement in the South



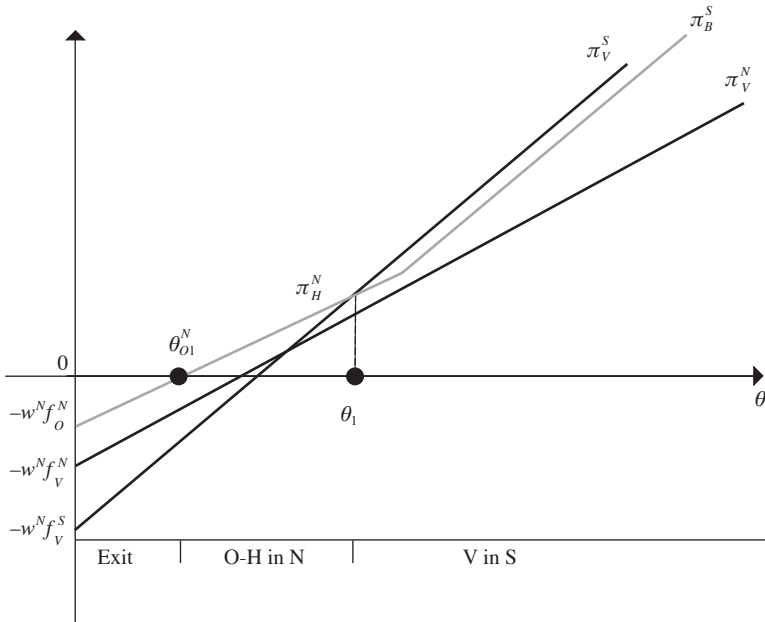
3.3. Optimal Sourcing Decisions

The analyses and results from the preceding two subsections will now be combined to derive the optimal organizational forms and locations in terms of vertical integration or outsourcing, in the North or the South.

• Weak contract enforcement in the South

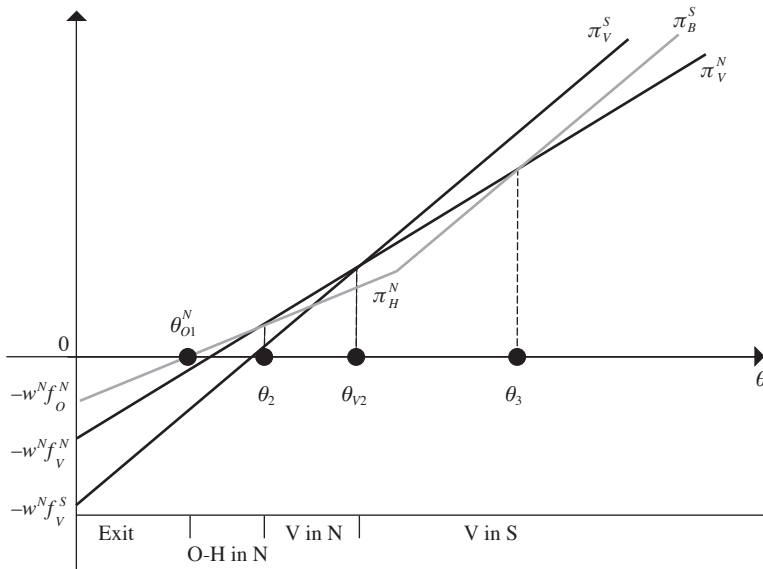
First to be considered is the case of very weak contract enforcement and small FDI costs in the South. Suppose that (10) holds and e^S is so small that it leads to the situation in Figure 4. Then, combining Figures 1 and 4 yields Figure 7, where only the top part of Figure 4 is kept (i.e., the larger profit part for every θ). Note that the lines π_V^S and π_B^S are parallel. Hence, if f_V^S is small (FDI in the South is not very costly), the line π_V^S is above the line π_B^S , and π_V^S intersects π_H^N at θ_1 . Then, firms with $\theta < \theta_{01}^N$ exit the market, firms with $\theta \in [\theta_{01}^N, \theta_1]$ choose O-H in N, and firms with $\theta > \theta_1$ choose vertical integration in the South (FDI, denoted as V in S). It can be easily seen that for very costly FDI in the South, the line π_V^S is below the line π_B^S . In that case, the equilibrium is the same as in Figure 4, without vertical integration in any region.

Figure 7: Equilibrium: Very weak contract enforcement in the South (1)



Then, very weak contract enforcement with a small vertical integration cost in the North is considered. Note that π_V^N is steeper than π_H^N . Hence, it is possible that these two lines intersect as drawn in Figure 8. This happens for small enough f_V^N . Then, firms with $\theta < \theta_{O1}^N$ exit the market, firms with $\theta \in [\theta_{O1}^N, \theta_2]$ choose O-H in N, and firms with $\theta \in [\theta_2, \theta_{V2}]$ choose vertical integration in the North (denoted as V in N), and firms with $\theta > \theta_{V2}$ choose V in S. It can be easily seen that for very costly FDI in the South, the line π_V^S is below the line π_B^S . Then, firms with $\theta \in [\theta_2, \theta_3]$ choose V in N, and firms with $\theta > \theta_3$ choose O-B in S.

Figure 8: Equilibrium: Very weak contract enforcement in the South (2)



Finally, the case of not very weak contract enforcement in the South is considered. In that case, we have Figure 5 instead of Figure 4. As above, the top part of Figure 5 is combined with Figure 1 to get Figure 9, which is similar to Figure 7 if f_V^S is small. Firms with $\theta < \theta_{01}^N$ exit the market, firms with $\theta \in [\theta_{01}^N, \theta_{02}]$ choose O-H in N, firms with $\theta \in (\theta_{02}, \theta_4]$ choose O-H in S, and firms with $\theta > \theta_4$ choose V in S (FDI).

Figure 9: Equilibrium: Not very weak contract enforcement in the South

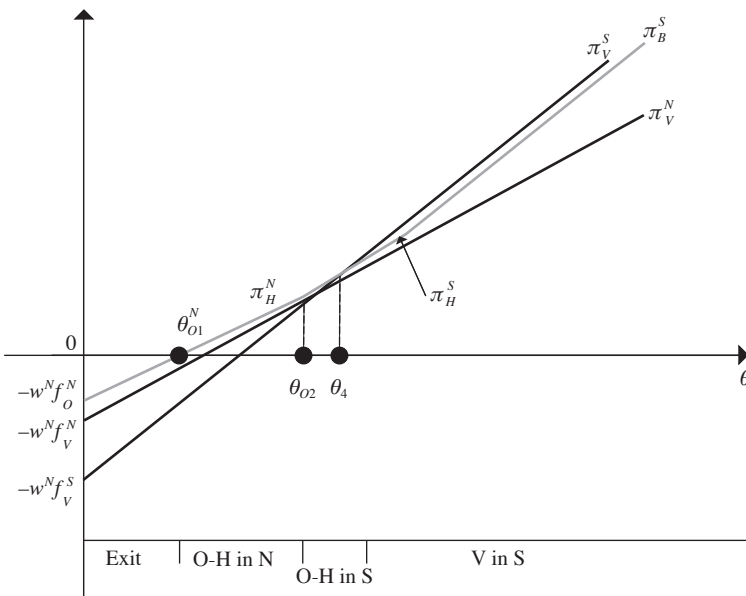
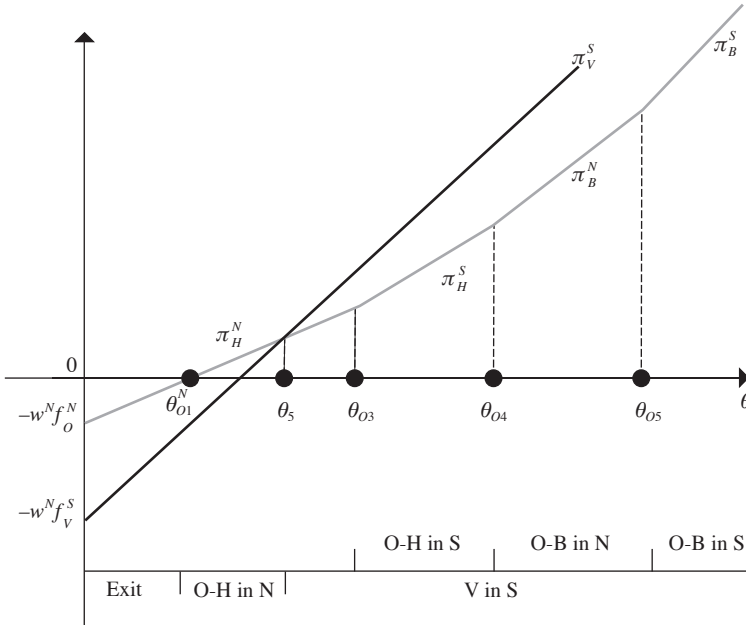


Figure 9 shows how the result will change as the fixed FDI cost in the South changes. As f_V^S decreases, the profit line π_V^S shifts up, which will enlarge the range of V in S at the expense of outsourcing, first shrinking the range of O-H in S and then shrinking the range of O-H in N. As f_V^S increases, the profit line π_V^S shifts down, which will enlarge the range of O-H in S and shrink the range of V in S. Eventually, there will be no FDI in the South and the optimal decision for the large- θ firms is O-B in S.

Figure 10: Equilibrium: Strong contract enforcement in the South



• Strong contract enforcement in the South

Suppose that (10) does not hold. Similarly to the analysis above, the relevant part of Figure 6 is kept and Figure 1 (mainly the profit line, π_V^S) is superimposed onto it to obtain the equilibrium decision. The result depends on the FDI cost in the South. Figure 10 depicts the case for small f_V^S . Firms with $\theta < \theta_{01}^N$ exit the market, firms with $\theta \in [\theta_{01}^N, \theta_5]$ choose O-H in N, and firms with $\theta > \theta_5$ choose V in S (FDI).

Figure 10 shows how the result will change as the FDI cost in the South changes. As f_V^S increases, the profit line π_V^S shifts down, which will enlarge the range of O-H in N and shrink the range of V in S. As f_V^S continues to increase, some firms will choose O-H in S (when line π_V^S cuts line π_H^S). Then some other firms will choose O-B in N (when line π_V^S cuts line π_B^S), while the range of V in S continues to shrink (θ_5 shifts to the right). Eventually, there will be no FDI in the South and the optimal decision for the large- θ firms is O-B in S (when line π_V^S lies below line π_B^S). This happens when $f_V^S > e^{st} + w^N f_O^S$.

- **Summary**

Contract enforcement and FDI costs are two important factors that jointly determine a firm's optimal organizational mode and its location of the intermediate good production. Based on the analysis in Figure 7 to Figure 10, some features of the equilibrium can be observed: (i) in the same region, firms choosing vertical integration have higher productivity than those choosing outsourcing; (ii) when contract enforcement in the South is very weak, low- θ firms choose O-H in N while high- θ firms choose FDI (in S); (iii) as contract enforcement in the South becomes stronger, outsourcing emerges in the South with lower- θ firms honoring their contracts and higher- θ firms breaching their contracts; and (iv) when contract enforcement in the South is sufficiently strong, some very high- θ firms switch from breaching contracts in the South to breaching contracts in the North. In general, strengthening contract enforcement in the South encourages firms to choose outsourcing over vertical integration and more contracts will be honored, but total outsourcing in the South may or may not increase.

4. Discussion and Concluding Remarks

The make-or-buy decision is examined with regard to location (North and South) and productivity (firm heterogeneity) in a complete contracting model. In contrast to the usual incomplete contracting approach to outsourcing (for example the global sourcing framework of Antràs and Helpman, 2004), this paper considers the situation in which outsourcing can be governed by contracts, but contract enforcement is imperfect (taken from Qiu's 2006 approach to modeling software development and copyright protection). It shows that a firm's productivity and regional differences in wage rates, fixed costs of vertical integration, fixed costs of outsourcing and degrees of contract enforcement jointly determine whether the firm will choose vertical integration or outsourcing, and whether it will locate the intermediate good production in the North or the South. Typically, firms with lower productivity tend to source (insource or outsource) in the North and firms with higher productivity tend to source in the South; firms with lower productivity tend to honor their contracts and firms with higher productivity tend to breach their contracts; firms with lower productivity tend to have outsourcing and firms with higher productivity tend to have vertical integration. The degree of contract enforcement in the South and other factors mentioned above affect the cut-off points of productivity that separate different decisions.

In this paper, as in Antràs and Helpman (2004), the fixed costs of vertical integration and outsourcing play crucial roles in determining the equilibrium organizational mode and location. One surprising result of this paper is that the more productive firms tend to breach contracts while the less productive firms tend to honor their contracts, given that they choose outsourcing in the same location. One responsible assumption for this result is the same fixed social cost (i.e., t) incurred by all firms should they breach contracts in the same location and should contracts be enforced by the court. This was assumed in the model so that only e^l captures the enforcement difference across regions. The outsourcing pattern and contracting pattern could be altered if t also varies across firms or across regions because then e^l and t_i^l (fixed cost for firm i in region l) jointly determine the effective degree of contract enforcement. For example, supposing t_i^l is larger for more

productive firms, then it is possible that the earlier observed contracting pattern could be reversed, i.e., the more productive firms honor their contracts and the less productive firms breach their contracts. Suppose t'_i is larger in the South than in the North. Then, those firms that choose O-B in the South in the previous case will find breaching contracts in the South so costly that they rather choose O-B in the North.

In this paper, it is assumed that payment to the intermediate good producers is made after they have produced and delivered the specific inputs to the final-good producers. As a result, the only party that can breach a contract is the final-good producer in the North. One may argue that it is more typical to observe developing countries' firms breaching contracts than to observe developed countries' firms breaching contracts. The important point offered here is about what types of contracts (with more productive firms or less productive firms) will be more likely to be breached, rather than which party of the contract will breach it. If it is assumed that final-good producers prepay intermediate-good producers under outsourcing, then the incentive for breaching contracts will come from the intermediate-good producers. However, it is not expected that this change will affect the qualitative aspects of the results obtained in this paper. To see this, let us focus the discussion on contract breaching. In Appendix A, the optimal level of intermediate goods input, $m(i)$, is derived, which shares a common property with the final good producers' optimal profits: both $m(i)$ and $\pi(i)$ are increasing and linear functions of θ . As payments to the intermediate-good producers are $w^i m(i)$ while the cost of breaching contracts does not vary across firms and across regions, it is not difficult to see that contracts offered by more productive firms are more likely to be breached by intermediate-good producers, the same result obtained earlier.

Appendix

A. Proof of the optimal profits

This proof applies to the optimal profits for both vertical integration and outsourcing in the case of perfect contract enforcement. It can be easily extended to the case of outsourcing with imperfect contract enforcement.

$$R(i) = X^{\mu-\alpha} \tilde{\theta}^\alpha \left[\frac{h(i)}{\eta} \right]^{\alpha\eta} \left[\frac{m(i)}{1-\eta} \right]^{\alpha(1-\eta)}$$

and

$$\pi_k^l = R(i) - w^N h(i) - w^l m(i) - w^N f_k^l,$$

gives

$$\frac{\partial R(i)}{\partial h(i)} = \alpha X^{\mu-\alpha} \tilde{\theta}^\alpha \left[\frac{h(i)}{\eta} \right]^{\alpha\eta-1} \left[\frac{m(i)}{1-\eta} \right]^{\alpha(1-\eta)},$$

$$\frac{\partial R(i)}{\partial m(i)} = \alpha X^{\mu-\alpha} \tilde{\theta}^\alpha \left[\frac{h(i)}{\eta} \right]^{\alpha\eta} \left[\frac{m(i)}{1-\eta} \right]^{\alpha(1-\eta)-1},$$

$$\frac{\partial \pi_k^l}{\partial h(i)} = \frac{\partial R(i)}{\partial h(i)} - w^N = 0 \quad \text{and} \quad \frac{\partial \pi_k^l}{\partial m(i)} = \frac{\partial R(i)}{\partial m(i)} - w^l = 0.$$

Then,

$$\alpha X^{\mu-\alpha} \tilde{\theta}^\alpha \left[\frac{h(i)}{\eta} \right]^{\alpha\eta-1} \left[\frac{m(i)}{1-\eta} \right]^{\alpha(1-\eta)} = w^N,$$

$$\alpha X^{\mu-\alpha} \tilde{\theta}^\alpha \left[\frac{h(i)}{\eta} \right]^{\alpha\eta} \left[\frac{m(i)}{1-\eta} \right]^{\alpha(1-\eta)-1} = w^l. \tag{A1}$$

Therefore,

$$\left[\frac{h(i)}{\eta} \right]^{-1} \left[\frac{m(i)}{1-\eta} \right] = \frac{w^N}{w^l}, \quad \text{or} \quad \frac{m(i)}{1-\eta} = \left(\frac{w^N}{w^l} \right) \frac{h(i)}{\eta}. \tag{A2}$$

Using (A2) in (A1) gives

$$\alpha X^{\mu-\alpha} \tilde{\theta}^\alpha \left[\frac{h(i)}{\eta} \right]^{\alpha\eta-1} \left(\frac{w^N}{w^l} \right)^{\alpha(1-\eta)} \left[\frac{h(i)}{\eta} \right]^{\alpha(1-\eta)} = w^N,$$

from which

$$h(i) = \eta \alpha^{\frac{1}{1-\alpha}} X^{\frac{\mu-\alpha}{1-\alpha}} \theta \left(\frac{w^N}{w^l} \right)^{\frac{\alpha(1-\eta)}{1-\alpha}} \left(\frac{1}{w^N} \right)^{\frac{1}{1-\alpha}}.$$

can be obtained. This is used in (A2) to get

$$m(i) = (1 - \eta) \alpha^{\frac{1}{1-\alpha}} X^{\frac{\mu-\alpha}{1-\alpha}} \theta \left(\frac{w^N}{w^l} \right)^{\frac{\alpha(1-\eta)}{1-\alpha}} \left(\frac{1}{w^N} \right)^{\frac{1}{1-\alpha}} \left(\frac{w^N}{w^l} \right).$$

The above two optimal decisions are substituted into the profit function to get the optimal profit:

$$\begin{aligned} \pi_k^l &= R(i) - w^N h(i) - w^l m(i) - w^N f_k^l \\ &= X^{\mu-\alpha} \tilde{\theta}^\alpha \left[\frac{h(i)}{\eta} \right]^{\alpha\eta} \left[\frac{m(i)}{1-\eta} \right]^{\alpha(1-\eta)} - w^N h(i) - w^l m(i) - w^N f_k^l \\ &= \alpha^{\frac{\alpha}{1-\alpha}} (1-\alpha) X^{\frac{\mu-\alpha}{1-\alpha}} \theta \left(\frac{w^N}{w^l} \right)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^N)^{\frac{-\alpha}{1-\alpha}} - w^N f_k^l \\ &= \pi(\theta) (w^l)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - w^N f_k^l. \end{aligned}$$

B. Specification of the cutoff points

Denote $\delta \equiv \frac{1}{1-\alpha} \alpha^{\frac{-\alpha}{1-\alpha}} X^{\frac{\alpha-\mu}{1-\alpha}}$. The cutoff points can be obtained as below

$$\begin{aligned} \theta_{V1} &= \delta (w^N)^{\frac{1}{1-\alpha}} f_V^N, \\ \theta_{V2} &= \delta (w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_V^S - f_V^N)}{(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right], \\ \theta_{V3} &= \delta (w^N)^{\frac{\alpha\eta}{1-\alpha} + 1} (w^S)^{\frac{\alpha(1-\eta)}{1-\alpha}} f_V^S, \\ \theta_{O1}^l &= \delta (w^N)^{\frac{\alpha\eta}{1-\alpha} + 1} (w^l)^{\frac{\alpha(1-\eta)}{1-\alpha}} (e^l)^{\frac{-\alpha(1-\eta)}{1-\alpha}} f_O^l, \\ \theta_{O1}^l &= \delta (w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{e^l + (w^l)^{\frac{\alpha(1-\eta)}{1-\alpha}}}{1 - (e^l)^{\frac{\alpha(1-\eta)}{1-\alpha}}} \right], \\ \theta_{O1}^N &= \delta (w^N)^{\frac{1}{1-\alpha}} (e^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}} f_O^N, \\ \theta_{O1} &= \delta (w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_O^S - f_O^N) + e^S t}{(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (e^N)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right], \end{aligned}$$

$$\theta_{O2} = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_O^S - f_O^N)}{(e^S)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (e^N)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right],$$

$$\theta_O^S = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{e^S t}{(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (e^S)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right],$$

$$\theta_{O3} = \theta_{O2} = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_O^S - f_O^N)}{(e^S)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (e^N)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right],$$

$$\theta_{O4} = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_O^S - f_O^N) - e^N t}{(e^S)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right],$$

$$\theta_{O5} = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_O^S - f_O^N) - (e^N - e^S) t}{(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right],$$

$$\theta_1 = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_V^S - f_O^N)}{(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (e^N)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right],$$

$$\theta_2 = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left\{ \frac{w^N (f_V^N - f_O^N)}{(w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}} [1 - (e^N)^{\frac{\alpha(1-\eta)}{1-\alpha}}]} \right\},$$

$$\theta_3 = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_O^S - f_V^N) + e^S t}{(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right],$$

$$\theta_4 = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_V^S - f_O^S)}{(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} [1 - (e^S)^{\frac{\alpha(1-\eta)}{1-\alpha}}]} \right],$$

$$\theta_5 = \delta(w^N)^{\frac{\alpha\eta}{1-\alpha}} \left[\frac{w^N (f_V^S - f_O^N)}{(w^S)^{\frac{-\alpha(1-\eta)}{1-\alpha}} - (e^N)^{\frac{\alpha(1-\eta)}{1-\alpha}} (w^N)^{\frac{-\alpha(1-\eta)}{1-\alpha}}} \right].$$

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