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Global Sourcing Patterns, Commercial Arbitrations Regimes, and Relationship-Specific Transactions

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Abstract

This paper provides a new framework for analyzing how the quality of commercial arbitration regimes affects sourcing patterns by introducing arbitration into a two-country sourcing model. In this model, final good producers in each country source a customized intermediate input domestically or globally. Commercial arbitration may be invoked when opportunistic behavior occurs, such as shaving investment quality and not paying in full for an investment. An arbitrator determines awards by fully verifying investments. Nonetheless, opportunism is not removed due to the national commercial arbitration regimes' imperfect support for enforcement of awards. I show that relative global sourcing rises (falls) with each country's quality of international (domestic) commercial arbitration regimes. Relative global sourcing also decreases with the degree of requiring relationship-specific transactions to produce the intermediate input. These predictions are empirically supported using a new measure I build for the qualities of domestic and international commercial arbitration regimes.

Keywords: Global sourcing, Commercial arbitration, Relationship-specific transactions

JEL Classification: F12, F14, D02

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1 Introduction

Arbitration, a private procedure leading to a binding and final resolution, is of growing importance in dispute settlement. The number of requests for arbitration to the International Chamber of Commerce (ICC), which is one of the main institutions administering arbitration processes, increased from 529 to 801 between 1999 and 2015.[1] This growth of arbitration is supported by the 2006 global survey result of the prominent use of arbitration by corporations, which was conducted by the School of International Arbitration at Queen Mary University of London.[2] Specifically, of the 103 surveyed corporations that were engaged in foreign transactions, 54 percent used international arbitration.[3] Seventy-three percent of the same respondents chose international arbitration as their preferred resolution mechanism in cross-border disputes. Transnational litigation was chosen by only 11 percent of them.

Particularly, the number of arbitration cases in China surged from 7,394 to 74,811 between 1999 and 2009 (Ali and Huang 2012, p. 79). Given that China is the main manufacturer in the world's production and that a great volume of transactions necessarily entail commercial disputes, this substantial increase might evidence that arbitration has been increasingly used to resolve international commercial disputes in the process of global sourcing. Despite this possibility under the growing significance of arbitration in resolving disputes, arbitration has never been introduced into sourcing models. Moreover, sourcing models have rarely considered institutions under the assumption of non-verifiability of investments.[4] In this paper, I fill these gaps by introducing arbitration into a two-country sourcing model and by considering institutions specified to national arbitration regimes as a solution to opportunism.

[1] See the ICC website: http://www.iccwbo.org.

[2] This survey targeted corporations that engage in cross-border transactions. A total of 143 corporations in various industries participated, which were mainly from the Middle East, Europe, and Asia. Specifically, 103 corporations completed an online questionnaire, and 40 corporations were interviewed. The surveyed corporations whose annual turnovers are more than US$5 billion, between US$500 million and US$ 5 billion, and averaging US$500 million account for 19 percent and 29 percent, and 25 percent of the respondents, respectively. For details, see http://www.arbitration.qmul.ac.uk/research/2006/123975.html.

[3] Nineteen percent of the 103 surveyed corporations did not use dispute resolution mechanisms. Thus, of the corporations that used dispute resolution mechanisms, about 67 percent used international arbitration.

[4] For example, see Grossman and Helpman (2002) and Antràs (2005).

To be clear, building on Antràs (2003, 2005), I analyze the effects of international and domestic commercial arbitration regimes' quality on global sourcing patterns in a general-equilibrium framework. Even though arbitration provides for a binding and final resolution, if a resulting arbitral award is not fully and voluntarily paid by a party, then a claimant has to rely on national arbitration regimes to collect the award. In this case, without the national regimes' full support for enforcement of the award, the claimant cannot collect the totality of the award. Thus, national arbitration regimes play a key role in enforcing arbitral awards, which in turn affects a firm's ex-ante opportunistic behavior.

I focus on transactions between an intermediate input supplier (IIS) and a final good producer (FGP). Each FGP in the two countries globally or domestically sources a customized intermediate input. The model permits two opportunistic behaviors, as in Antràs and Foley (2015). The IIS might shave the value of the intermediate input and the FGP might not pay in full after the ordered products arrive. When such opportunism occurs, domestic and international commercial arbitration can proceed under the choices of domestic and global sourcing, respectively. Then, how fully arbitration regimes support the enforcement, which is referred to as the quality of arbitration regimes, determines the firms' ex-ante behaviors. Further, the incomplete enforcement of arbitral awards of countries makes relationship-specificity (rs) intensity matter. The rs intensity refers to the degree in which firms intensively use a component requiring a relationship-specific (rs) transaction to produce a good. In this setting, I analyze how rs intensity affects sourcing patterns. I also examine how the individual effects of arbitration regimes' quality and rs intensity are related.

This paper builds on the literature on incomplete contract enforcement and relationship-specific investments. Since Williamson (1975, 1979), Goldberg (1976), and Klein et al. (1978) developed a concept of transaction-specific and specialized investments that are linked to opportunism, researchers have combined this concept with comparative advantage. That is, while focusing on contract enforcement as the main role of institutions based on North (1990), researchers have shown that countries with better institutions tend to have comparative

advantage in industries for which the relationship between the parties tied up within contracts is important (Levchenko, 2007; Nunn, 2007; Costinot, 2009). My paper takes a different step by considering relationship-specificity and the incomplete enforcement of arbitral awards as a setting for examining global sourcing patterns.

This paper also builds on the literature on firm organization and incomplete contracts. This line of research takes a property rights approach, following Coase (1937). That is, if there are high costs in specifying provisions that are contingent on every possible situation, firm integration is emphasized as a way to reduce transaction costs by obtaining rights to control another party's assets (Grossman and Hart, 1986; Hart and Moore, 1990). This property rights approach has received more development from Antràs (2003, 2005) and Antràs and Helpman (2004), illustrating how incomplete contracts affect a firm's organization mode between vertical integration and outsourcing. This literature tends to assume non-verifiability of investments that leads to non-contractibility. Hence, this non-verifiability assumption does not give room for examining contract enforcement. When partial-verifiability is allowed, verifiable investments are contractible and contract enforcement is assumed to be automatically achieved (Grossman and Helpman, 2005).

This paper focuses on the enforcement problem of arbitral awards by taking a new approach. It assumes full verifiability of investment by a capable arbitrator when commercial disputes occur. This allows the value each party is supposed to receive to be stipulated in a contract. Even in this seemingly non-risky case, a firm's opportunism is not removed due to the imperfect national arbitration regimes' support for enforcement of arbitral awards. Thus, what matters in attenuating opportunism is the quality of commercial arbitration regimes, which in turn determines a firm's sourcing mode and trade pattern.

To see why the full verifiability assumption is needed, consider the case where partial verifiability of investment is allowed. In this case, a firm's opportunism will be affected by the partial verifiability as well as the quality of commercial arbitration regimes. Specifically, the non-verifiable portion of an investment is non-contractible, which affects the opportunism.

Since commercial arbitration hinges on contracts, which I will explain later, this portion is not affected by commercial arbitration regimes. On the contrary, the verifiable portion of the investment is contractible, and hence the opportunism depends on enforcement of an arbitral award, which is ultimately determined by the quality of commercial arbitration regimes. Therefore, the full verifiability assumption ensures that a firm's opportunistic behavior arises solely due to the imperfect arbitration regimes, which simplifies the analysis of the effect of the quality of commercial arbitration regimes on firm behavior.

The enforcement issue matters even in the case where intermediate inputs are sourced from an integrated firm within a multinational firm's boundary. If a country's arbitration regimes do not support enforcing an arbitral award, the financial loss incurred due to opportunism is assumed to become a sunk cost regardless of whether a transaction occurs within a multinational's boundary. The multinational would neither seize nor sell the integrated firm's assets to cover the loss since they belong to the multinational itself. Thus, this assumption allows for concentrating on two modes of sourcing throughout this paper: domestic and global sourcing.

I exclusively discuss commercial arbitration, which is defined as a "private, nongovernmental process, fashioned by contract, which provides for the binding resolution of a dispute through the decision of one or more private individuals selected by the disputants" in Stromberg (2007, p. 1341).[5] According to the footnote in Article (1) of the United Nations Commission on International Trade Law (UNCITRAL) Model Law on International Commercial Arbitration (henceforth, the Model Law), "[T]he term commercial should be given a wide interpretation so as to cover matters arising from all relationships of a commercial nature, whether contractual or not." Commercial arbitration is different from investment arbitration, in that investment arbitration rests on either an investment treaty, bilateral treaty (BIT), investment law of the host state, or investment agreement.[6]

[5]Actually, this definition is made for "international" commercial arbitration by Stromberg because he only looks at international disputes in his paper. Thus, when both domestic and international disputes are examined, this definition is not limited to international commercial arbitration.

[6]For details, see Böckstiegel (2012) and the fourth footnote of Pouget (2013, pp. 5-6).

The definition of international arbitration can be understood by Article 1 (3) of the Model Law, which distinguishes international arbitration from domestic arbitration based on the place of business and the place of arbitration.[7] Specifically, there are four conditions under which an arbitration is considered international: i) the places of business of the parties are in different states, ii) the place of arbitration is outside of the state in which their businesses are situated, iii) the place where their obligations are mainly performed or the place in which the dispute's subject matter is mainly involved is outside of the state in which their businesses are situated, and iv) the parties explicitly agreed that more than one country is involved in the subject matter of the arbitration agreement.

Foreign arbitral awards, defined as "arbitral awards made in the territory of a State other than the State where the recognition and enforcement of such awards are sought" in Article I of the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (henceforth, the New York Convention), must be enforced by a signatory of the New York Convention. However, the awards may not be enforced on the grounds of Article V of this convention that permits national courts to refuse rendered foreign awards, either at the request of a party against whom the awards are made or by the court in the country where the enforcement is sought.

Thus, when the respondent's country lacks regimes that enforce a foreign arbitral award, Article V is used as grounds for nullifying the award that is rendered against a local firm. For example, in the case of United World Ltd. Inc. v. Krasny Yakor, the Russian Court of Cassation did not enforce an award rendered by the ICC on the grounds of Russian public policy. That is, the award would cause Red Anchor, a Russian respondent, to be bankrupted, which would in turn harm the Russian economy as a whole. It was therefore against the public interest (Glusker 2010, p. 13). As another example, in the case of Forever Maritime v. Masbinoimport, a foreign company could not enforce an arbitral award against a Russian state-owned company because the Russian court ruled that the foreign company did not duly

[7] In fact, the distinction between domestic and international arbitration depends on national law (Bergsten 2005, p.12).

notify the Russian company of the place and time for arbitration hearings. Even though the foreign company presented evidence that they, in fact, sent a notification, the court ruled that it was not certified and refused to enforce it (Budylin 2009, p. 156).[8]

In addition, when the claimant finds it difficult to collect a resulting foreign award from the respondent, she has to rely on the local court to enforce the awards. If the respondent's assets are in the claimant's country, she can confiscate them to collect the award with the confirmation of the local court.[9] Therefore, both countries' international arbitration regimes determine the enforcement of the arbitral awards that are made in international arbitration.[10] Given the assumption of the full verifiability of the investment of an intermediate input, a claimant can fully recover her financial loss as long as a respondent voluntarily pays a resulting award. What determines parties' ex-ante behaviors is the qualities of their countries' commercial arbitration regimes, regardless of the place where arbitration occurs. Likewise, the quality of domestic arbitration regimes determines the enforcement of awards made in domestic arbitration, which also affects parties' ex-ante behaviors.

When an opportunistic behavior occurs, each party may initiate commercial arbitration to cover a financial loss rather than just accepting the loss. With a higher quality of arbitration regime, the loss is more likely to be covered through arbitration proceedings. Since arbitration acts as an outside option for a party who suffers a loss by another party's opportunistic behavior, a higher quality of arbitration regimes (i.e., the higher value of the outside option) of each party better mitigates opportunism. Thus, as the quality of the international commercial arbitration regime rises, opportunism is reduced, which in turn attracts more global sourcing. Similarly, a higher quality domestic arbitration regime expands domestic sourcing by the FGP.

[8]Budylin (2009) shows various cases regarding this protectionism of the Russia court towards local firms. See also Berkowitz et al. (2006, p. 365) for the case of a Brazilian court's partiality towards local firms.

[9]Zawadski (2008, pp.137-39) describes how claimant's court affects the enforcement of a foreign award by giving an example of medical outsourcing, which is based on a pending case.

[10]In fact, domestic arbitral awards may be made in international arbitration. This will be explained in Section 6.2. Even in this case, both countries' international arbitration regimes matter in enforcing the awards.

Under this mechanism in the model, when one country's FGP chooses global sourcing, the other country's FGP chooses domestic sourcing, in equilibrium, with certain conditions. Equilibrium production is derived by backward induction in the presence of a lump-sum transfer from an IIS, which was introduced by Antràs (2003, 2005). The results show that global sourcing relative to the foreign source country's domestic sourcing rises (falls) with the quality of international (domestic) commercial arbitration regimes in each country. In addition, relative global sourcing decreases with the rs intensity of the intermediate input. Intuitively, as rs intensity is higher, an FGP is more exposed to opportunism in both global and domestic sourcing. However, this risk is lower when using domestic sourcing since arbitral awards are better enforced through domestic arbitration than international arbitration due to a court's partiality towards local firms.

To empirically test these results, I construct a new measure for the country-specific domestic and international commercial arbitration regime's quality using the 2010 World Bank's Arbitrating and Mediating Dispute (AMD) survey, which exclusively covers commercial arbitration.[11] Specifically, I choose the 29 survey questions that are related to the enforcement matter of arbitral awards for the construction of this measure. I additionally construct a measure for an industry-specific rs intensity. This construction is based on the classification of internationally traded commodities by Rauch (1999). Specifically, following Nunn (2007), if an input is neither traded on an organized exchange nor reference priced, the input is considered to require an rs transaction. Otherwise, it is considered as an input that does not require an rs transaction. To construct rs intensity measure, I also use the World Input-Output Database (WIOD) that allows for measuring countries' input and output shares for each output industry. Then, an industry-specific rs intensity is measured by the sum of the weighted proportions of the inputs requiring an rs transaction by the shares of these inputs of an industry and by countries' output shares of the industry.

The empirical results support the theoretical predictions, while controlling for a sub-

[11] For details about the AMD survey, see Pouget (2013).

stantial portion of variation that may generate reverse causality. Specifically, a 1 percent rise in the quality of the source (destination) country's international commercial arbitration regimes contributes to a 15.53–15.68 percent (15.43–15.68 percent) increase in global sourcing relative to the source country's domestic sourcing. In contrast, a 1 percent rise in the quality of the source (destination) country's domestic commercial arbitration regimes leads to a 12.39–12.50 percent (12.58–12.91 percent) fall in relative global sourcing. In addition, a 1 percent rise in the rs intensity of an input industry leads to a 1.91 percent fall in relative global sourcing.

These results show that the quality of commercial arbitration regimes and rs intensity are important determinants of global sourcing patterns. They further imply that private resolution mechanisms play a key role in determining sourcing patterns, and that firms avoid choosing risky sourcing modes that are subject to opportunism.

The rest of this paper is organized as follows. Sections 2 and 3 develop a model in which rs intensity and the qualities of domestic and international commercial arbitration regimes determine sourcing patterns. Section 4 discusses the general-equilibrium results. Section 5 characterizes the empirical model. Section 6 describes the data employed and how the measures are constructed, and Section 7 discusses empirical results. Section 8 concludes.

2 General Setting

Consider two countries, i and j, where consumption and production structures are symmetric. Firms produce a continuum of differentiated varieties, ω, of a single good, y. A representative consumer in country j maximizes the following utility function:

$$u_j = \left[\int_{\omega=0}^{n_i} y_{ij}(\omega)^{\frac{\sigma-1}{\sigma}} d\omega + \int_{\omega=0}^{n_j} y_{jj}(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right]^{\frac{\sigma}{\sigma-1}}, \tag{1}$$

where $y_{ij}(\omega)$ ($y_{jj}(\omega)$) is the quantity demanded of variety ω in j, which is produced in i (j), n_i (n_j) is the number of differentiated varieties of the good y produced in i (j), and $\sigma > 1$ is the elasticity of substitution between any pair of varieties.

Utility maximization yields the following demand function:

$$y_{ij}(\omega) = \lambda_j p_{ij}(\omega)^{-\sigma}, \quad y_{jj}(\omega) = \lambda_j p_{jj}(\omega)^{-\sigma}, \tag{2}$$

where $p_{ij}(\omega)$ ($p_{jj}(\omega)$) is the price of ω in j, which is produced in i (j),

$$\lambda_j = \frac{E_j}{P_j^{1-\sigma}} = \frac{E_j}{\int_{\omega=0}^{n_i} p_{ij}(\omega)^{1-\sigma} d\omega + \int_{\omega=0}^{n_j} p_{jj}(\omega)^{1-\sigma} d\omega}, \tag{3}$$

where P_j and E_j are country j's price index and aggregate spending, respectively. Firms take λ_j as exogenously given, implying a constant price elasticity of demand.

To produce one unit of y, a final good producer (FGP) needs to globally or domestically source one unit of customized intermediate input, x, from an intermediate input supplier (IIS). Technology for the production of x follows a Cobb-Douglas function:

$$x(\omega) = \left(\frac{R}{\theta}\right)^{\theta} \left(\frac{N}{1-\theta}\right)^{1-\theta}, \tag{4}$$

where R is the component that requires a relationship-specific (rs) transaction, and N is the component that features a non-relationship-specific ($non\text{-}rs$) transaction. The customization of the intermediate input for the FGP's taste comes from R only. $\theta \in (0, 1)$ represents the degree to which each IIS intensively uses the R component requiring rs transactions to produce x, which is referred to as rs intensity. Note that R and N are produced by the same IIS.

One way to conceptualize R and N components is using the classification of internationally traded commodities by Rauch (1999). Following Nunn (2007), if a component is neither traded on organized exchanges nor reference priced, then the component is considered as R. Otherwise, the component is considered as N. In Section 6.3, rs intensity is empirically measured using this classification.

The R and N components can be either high-quality or low-quality. For the production of each high-quality component, one unit of labor is required. On the contrary, a low-quality component can be produced at a negligible cost and has no value. For example, workers

can produce low-quality R and N components with negligible effort at the same time while producing high-quality R and N components. x can be produced regardless of the qualities of R and N using the technology in equation (4). Firms separately measure the value of R and N in terms of the value of the final good produced by using each of them. Thus, even if x is comprised of one low-quality component, the other high-quality component generates some portion of the value that a final good is supposed to have. The technology in equation (4) and the input requirements of R and N imply that the marginal cost of x, which is comprised of both high-quality components, is equal to the wage in i, meaning that one unit of labor in i is required to produce one unit of x. Once x is sourced from an IIS, the FGP notices the value of each R and N. The FGP can produce y without further cost. However, for the sales of one unit of y, the FGP should hire one unit of labor.

3 Firm Behavior with Commercial Arbitration

3.1 Commercial Arbitration

I consider two opportunistic behaviors between the FGP and IIS, as in Antràs and Foley (2015). The FGP might not pay in full for the investment of the IIS after the intermediate inputs arrive, and the IIS might produce low-quality components, which lowers the value of the intermediate inputs. They make a contract including the provision that a party may proceed to arbitration when such opportunistic behavior occurs. They also specify, in the contract, a value of V that a party is supposed to receive. The FGP should pay exactly the value the IIS produces. Thus, V can be the value of the investment of intermediate inputs that are supposed to be produced by the IIS and can be the payment that is supposed to be made by the FGP.

Imagine a situation in which an opportunistic behavior occurs by one party, and the other party initiates arbitration. They agree with the choice of an arbitrator who is fair and fully capable of verifying the quality of x and converting it into value.[12] If the respondent is the

[12]The arbitrator is one of the labors in either i or j.

FGP who initially paid less than V, this full verifiability assumption ensures the following relationship:

$$\text{Resulting arbitral award} + \text{initial payment by a respondent} = V. \tag{5}$$

The (perfect) enforcement of an arbitral award refers to the (full) payment of the resulting arbitral award made by an arbitration tribunal's verdict. Thus, only when the resulting arbitral award is equal to the amount of arbitral award actually paid by the FGP is the award perfectly enforced, and the IIS's financial loss is fully recovered. If the respondent does not voluntarily abide by the resulting arbitral award, which constitutes imperfect enforcement of the award, then the claimant should rely on the national regimes to enforce the award.

To see the enforceability of the award under the imperfect arbitration regimes, I introduce the quality of country i's domestic and international commercial arbitration regimes, denoted by $D_i \in (0,1)$ and $A_i \in (0,1)$, respectively. Quality refers to how fully commercial arbitration regimes enforce resulting arbitral awards. In the case of domestic commercial arbitration in which i's FGP is the respondent, the claimant is able to ultimately receive VD_i by recovering the loss through the arbitration proceedings. This implies the following:

$$\text{Arbitral award paid by a respondent} + \text{initial payment by a respondent} = VD_i. \tag{6}$$

When two parties engage in international commercial arbitration in which i's FGP is the respondent, both countries' legal systems are assumed to independently exert the enforcement of an arbitral award. Suppose that $A_j = 1$. Even if i's FGP initially pays less than VA_i, j's IIS will be able to finally receive VA_i from i's FGP by relying on i's arbitration regimes. However, if $A_j < 1$, i's FGP will ultimately pay less than VA_i. The FGP knows that even if she pays less than VA_i but more than VA_iA_j, j's IIS will accept the aggregate payment since country j does not have a perfect national arbitration regime to enforce the resulting award more than VA_iA_j. The FGP will cut the payment until it reaches VA_iA_j. Therefore, through the international arbitration proceedings, i's FGP will ultimately pay

VA_iA_j to the j's IIS, which is expressed as follows:

$$\text{Arbitral award paid by a respondent} + \text{initial payment by a respondent} = VA_iA_j. \quad (7)$$

Equations (6) and (7) hold only if initial payment by a respondent is less than VD_i and VA_iA_j, respectively. Otherwise, the FGP pays nothing for the arbitral award because she already paid more than or equal to the aggregate amount the IIS is able to collect through the arbitration proceedings.

Note that if the respondent was the IIS, then "initial payment by a respondent" in equations (5), (6), and (7) should be replaced with "initial value of the investment made by a respondent."

Combining the definitions of the enforcement of arbitral awards and the quality of arbitration regimes, the quality refers to how fully arbitration regimes make a respondent pay the resulting arbitral award. This definition is captured by the equations (6) and (7), in which D_i, A_i, and A_j determine the proportion of the aggregate payment by a respondent, which in turn determines the award actually paid. As they rise, the award paid rises as well.

The reason why D_i, A_i, and A_j are directly linked to V, not the arbitral award actually paid, is that what matters in determining a firm's behavior is the aggregate amount that the firm is able to ultimately receive from another party. By fixing this aggregate amount to be a value that increases with D_i, A_i, and A_j, the model is simplified, which will be shown in Section 3.2.

Let us consider a numerical example in which i's FGP was supposed to pay \$100 million for j's investment of intermediate inputs but paid less than that. Then, an international arbitration initiated by j's IIS proceeded in country i, and a resulting arbitral award was made by an arbitration tribunal's verdict.[13] A_i and A_j are given by 0.8 and 0.5, respectively. Now, the IIS in j should collect the resulting arbitral award.

If i's FGP initially paid \$80 million, then the resulting arbitral award is \$20 million under

[13]Actually, both A_i and A_j matter for the enforcement of the resulting arbitral award regardless of where the award is made.

the full verifiability of the quality of intermediate inputs. However, j's IIS will not collect any of the award from i's FGP since the initial payment by i's FGP exceeds \$40 million of VA_iA_j.

If i's FGP initially paid \$30 million, then \$70 million of the resulting arbitral award is made. Since VA_iA_j is \$40 million, the award actually paid by the FGP is \$10 million. Suppose that A_j rises to 0.9, holding other conditions fixed. Then, the resulting arbitral award will stay the same, but VA_iA_j increases to \$72 million. Thus, the award actually paid the FGP rises to \$42 million.

Let us take a close look at what A_i means. A_i not only captures how well country i enforces an award rendered in favor of a local firm, but also captures how well country i enforces an award rendered to a foreign firm in country j against a local firm. I assume that the degree of enforcing an award rendered to a local firm in international arbitration is the same as the degree of enforcing an award made in domestic arbitration in that both awards are rendered in favor of a local firm. However, when an award is rendered against a local firm in international arbitration, the court will be more likely to be partial towards the local firm to protect it, which lowers the arbitral award actually paid. The cases of United World Ltd. Inc. v. Krasny Yakor and Forever Maritime v. Masbinoimport described in the Introduction are examples of this partiality. Then, it is natural to assume that when a party does not voluntarily abide by the arbitral award, a claimant collects the award at a higher degree in a case of domestic arbitration than of international arbitration, which implies a higher enforcement of the domestic arbitral award. Therefore, the quality of domestic arbitration regime is assumed to be greater than or equal to the quality of the international arbitration regime, i.e., $D_i \geq A_i$.

Under this setting, the game between the FGP and IIS proceeds in the following chronological order. At t_0, the FGP and IIS make a contract including the provision of arbitration, which is determined based on the specified V that a party is supposed to receive. The contract also includes the provision ensuring that all revenues that the FGP make accrue to

the IIS. In exchange for that, the IIS makes a lump-sum transfer T to the FGP.[14] At t_1, the intermediate input, x, is produced. The IIS separately chooses the value of the investment of R and N. She can lower the value of x by using a low-quality component that has no value. At t_2, the x arrives at the FGP. Then, the FGP separately pays for the investment of R and N to the IIS. At t_3, if a party does not live up to the contract, commercial arbitration may occur. Specifically, an international commercial arbitration proceeds under global sourcing, and a domestic commercial arbitration takes place under domestic sourcing. At t_4, the final good, y, is produced and sold. The equilibrium production and price are derived by backward induction in the presence of the lump-sum transfer following Antràs (2003, 2005).

It is important to note that this game implicitly assumes that litigation and commercial arbitration are perfectly substitutable, and the enforceability of awards made through commercial arbitration is greater than the enforceability of the corresponding awards made through litigation under the full verifiability assumption. This higher enforceability is represented by the following inequalities: $0 < \widehat{D_i} < D_i < 1$ and $0 < \widehat{A_i} < A_i < 1$, where $\widehat{A_i}$ and $\widehat{D_i}$ index country i's quality of international and domestic commercial litigation regimes, respectively. Under this implicit assumption, firms only consider commercial arbitration as a dispute resolution mechanism.

3.2 Ex-ante Revenues for the IIS

In equations (6) and (7), the initial payment and arbitral award paid by a respondent are endogenously determined by a firm's optimal behavior. To examine how this works, I first specify the notation from the perspective of the FGP in j as follows: $x_{ij}(\omega)$ $(x_{jj}(\omega))$ is the quantity of the intermediate input sourced from i (j), which is used to produce the variety of

[14]Suppose that the revenue the FGP makes by domestic and international sales is shared with the IIS in such a way that the $\beta \in (0,1)$ portion of the revenue is going into the IIS. In this case, the price will be inflated by $\frac{1}{\beta}$, and the output level will be deflated by β^{σ}, according to the logic that will be described in Section 3.2. Then, a rational FGP will choose β equal to 1 because the FGP will receive the lump-sum transfer, which is the same as all profits the IIS makes because of the competition with other potential IISs producing the intermediate input. Therefore, the assumption that all the FGP's revenues accrue to the IIS reflects this FGP's profit maximization process.

ω by an FGP in j, and $y_j(\omega)$ is the total number of final goods that are produced by the FGP in j and consumed by consumers in both countries, implying that $y_j(\omega) = y_{ji}(\omega) + y_{jj}(\omega)$. x and y are assumed to be freely traded to focus on how imperfect contract enforcement affects firms' behaviors in the presence of commercial arbitration. Accordingly, $p_{ji}(\omega) = p_{jj}(\omega)$ in equation (2), and henceforth $p_j(\omega)$, the price of the variety of w charged by an FGP in j, is used to indicate $p_{ji}(\omega)$ and $p_{jj}(\omega)$.

Now, the FGP in j plans to source $x(\omega)$ units of intermediate input to produce $y_j(\omega)$ units of the final good. The unit labor requirement of R, N, and x implies that for the production of $x(\omega)$ units of the intermediate input, the number of labor demanded is $x(\omega)$, which should be the sum of the quantity demanded of R and N. Under this condition, to produce $x(\omega)$ units of the intermediate input using the technology in equation (4), an IIS produces $\theta x(\omega)$ units of R and $(1-\theta)x(\omega)$ units of N. The FGP separately pays for the investments of R and N to the IIS.

Firms measure the value of the investment of a component based on the value of the final good that will be generated by the component's investment. The Cobb-Douglas function in equation (4) and $y_j(\omega) = x(\omega)$ imply that when producing $y_j(\omega)$ units of y, the production of $\theta y_j(\omega)$ units of them is contributed by R, while the production of $(1-\theta)y_j(\omega)$ units of them is contributed by N. Thus, without opportunistic behavior, the values of investment of $\theta x(\omega)$ units of R and $(1-\theta)x(\omega)$ units of N are $\theta p_j(\omega)y_j(\omega)$ and $(1-\theta)p_j(\omega)y_j(\omega)$, respectively. Recall that the FGP is supposed to pay exactly the value the IIS invests.

Let us first consider the case where the FGP in j chooses to source the intermediate input from country i. The IIS in i should produce $\theta x_{ij}(\omega)$ units of R. Since the component R requires an rs transaction, the parties are locked into their own relationship and unable to transact their business with another firm. Under this condition, if the FGP pays less than $\theta p_j(\omega)y_j(\omega)A_iA_j$, the IIS will initiate an arbitration. Then, the FGP will have to pay a part of the resulting award, which is the difference between $\theta p_j(\omega)y_j(\omega)A_iA_j$ and the value that was initially paid to the IIS, so that the IIS will ultimately receive $\theta p_j(\omega)y_j(\omega)A_iA_j$

from the FGP. If the FGP pays more than $\theta p_j(\omega)y_j(\omega)A_iA_j$ but less than $\theta p_j(\omega)y_j(\omega)$, then the IIS will just bear the loss and not initiate an arbitration. Even if the IIS initiates an arbitration, she will collect nothing for the resulting award since the FGP already paid more than $\theta p_j(\omega)y_j(\omega)A_iA_j$, which is the aggregate amount that the IIS can collect through arbitration proceedings. Nonetheless, this is not an optimal choice for the FGP in that she will lose a higher profit opportunity. Therefore, for the FGP, the optimal payment for the investment of $\theta x_{ij}(\omega)$ units of R is $\theta p_j(\omega)y_j(\omega)A_iA_j$.

Expecting this payment from the FGP, the IIS determines the value of $\theta x_{ij}(\omega)$ units of R. The IIS can shave the value of the investment by producing low-quality R at a negligible cost. If the IIS produces $\theta x_{ij}(\omega)$ units of R that are worth less than $\theta p_j(\omega)y_j(\omega)A_iA_j$, the FGP will initiate an arbitration. Then, the IIS should pay the difference between the component's value that is initially produced and $\theta p_j(\omega)y_j(\omega)A_iA_j$ to the FGP. In this way, the FGP will ultimately make a revenue of $\theta p_j(\omega)y_j(\omega)A_iA_j$. If the IIS produces $\theta x_{ij}(\omega)$ units of R that are worth greater than $\theta p_j(\omega)y_j(\omega)A_iA_j$ but less than $\theta p_j(\omega)y_j(\omega)$, the FGP will not initiate an arbitration. Even if the FGP initiates an arbitration, she will collect zero for the resulting award since the IIS's initial investment value already exceeds $\theta p_j(\omega)y_j(\omega)A_iA_j$. However, this value of the investment is not optimal because it is higher than the payment the IIS will receive from the FGP and because the IIS will lose a higher profit opportunity. Hence, the optimal value of the $\theta x_{ij}(\omega)$ units of R that are produced by the IIS is $\theta p_j(\omega)y_j(\omega)A_iA_j$, which is the ex-ante revenue for the IIS.

The probability of a dispute between the parties is endogenously determined based on this discussion. Specifically, when the payment by the FGP or the investment value for R is between 0 and VA_iA_j, where $V = \theta p_j(\omega)y_j(\omega)$, arbitration proceeds, implying that a dispute occurs. When the payment or the investment value is between VA_iA_j and V, they do not initiate arbitration since the payment or the investment value already exceeds the capacity a party ultimately receives by the supports of commercial arbitration regimes. Expecting this, they do not start a dispute. Therefore, the probability of a dispute is $VA_iA_j/V = A_iA_j$.

Intuitively, as A_iA_j rises, parties have more disputes because a party that suffers a financial loss due to another party's opportunistic behavior is more likely to depend on arbitration, while expecting that her financial loss is better recovered through the higher quality of arbitration regimes. Conversely, as A_iA_j falls, the parties are in less disputes since they know that even if arbitration is initiated to resolve a dispute, they will be less likely to recover their financial loss.

Returning to the sourcing problem of the intermediate input, the IIS should produce $(1-\theta)x_{ij}(\omega)$ units of N, as well. Since the component N does not require rs transactions, traders are expected to easily search for another partner through a public mechanism, such as reference prices and organized exchanges in Rauch (1999). To focus on the difference in terms of relationship-specificity from the component R, traders are assumed to find another partner without any search friction and make a transaction with the new partner without discounting the product value. If the FGP pays less than $(1-\theta)p_j(\omega)y_j(\omega)$, the IIS will take the component back from the FGP and sell it to another FGP in the market, rather than relying on arbitration proceedings. This is because the IIS will make a lower revenue of $(1-\theta)p_j(\omega)y_j(\omega)A_iA_j$ through an arbitration than the revenue made by transacting the product with a new partner in the market. Thus, for the FGP, the optimal payment for the investment of $(1-\theta)x_{ij}(\omega)$ units of N is $(1-\theta)p_j(\omega)y_j(\omega)$.

Again, expecting this payment from the FGP, the IIS chooses the value of $(1-\theta)x_{ij}(\omega)$ units of N. If the IIS produces the component that is worth less than $(1-\theta)p_j(\omega)y_j(\omega)$, the FGP will end the transaction with the IIS and buy the component from another firm in the market. The IIS, of course, does not produce a component that is worth more than the payment from the FGP. Therefore, for the IIS, the optimal production value of $(1-\theta)x_{ij}(\omega)$ units of N is $(1-\theta)p_j(\omega)y_j(\omega)$, which is the ex-ante revenue for the IIS.

The fact that arbitration never occurs in the sourcing process of N implies that the probability of a dispute is zero. That is, the presence of a public mechanism that allows the parties to fully recover a financial loss makes disputes and arbitration never happen.

Next, let us consider the case where the FGP in j engages in domestic sourcing. Since her trading partner is in the same country, j, the quality of domestic commercial arbitration regimes affects the firms' behaviors. Using the same techniques, the ex-ante revenue for the IIS from producing $\theta x_{jj}(\omega)$ units of R is $\theta p_j(\omega) y_j(\omega) D_j$, and the probability of a dispute regarding the R component is D_j. The ex-ante revenue from producing $(1-\theta)x_{jj}(\omega)$ units of N is $(1-\theta)p_j(\omega)y_j(\omega)$, and the probability of a dispute regarding the N component is zero.

To summarize these firms' behaviors, arbitration acts as an outside option for a party that suffers a financial loss from its trading partner's breach of contract. Thus, the opportunistic behavior of each party is limited by the presence of the arbitration. More importantly, the role of the effective arbitration regime as a mitigator of the opportunism works only for the investment of R. In such investment, the optimal payment by j's FGP and the optimal investment by the IIS is exactly the same as VA_iA_j and VD_j in global and domestic sourcing, respectively. Therefore, it follows that, in equilibrium, the award actually paid is zero. For the investment of $(1-\theta)x(\omega)$ units of N, an arbitration is not considered as an outside option since the firms have the better option of making a transaction with another business partner through a public mechanism.

3.3 Choice of Sourcing Mode

Let us first consider the case where the FGP in j chooses global sourcing from country i. The ex-ante revenue for the IIS in i by producing $\theta x_{ij}(\omega)$ units of R and $(1-\theta)x_{ij}(\omega)$ units of N is the sum of $\theta p_j(\omega) y_j(\omega) A_i A_j$ and $(1-\theta)p_j(\omega)y_j(\omega)$. By using $y_j(\omega) = y_{ji}(\omega) + y_{jj}(\omega)$, the ex-ante revenue is $(\theta A_i A_j + 1 - \theta)\left[p_j(\omega)y_{ji}(\omega) + p_j(\omega)y_{jj}(\omega)\right]$. Additionally, since $y_j(\omega) = x_{ij}(\omega)$, the choice of $x_{ij}(\omega)$ maximizing the ex-ante profit can be considered as the sum of the $y_{ji}(\omega)$ and $y_{jj}(\omega)$, each of which maximizes the profit for each market according to its own demand structure. On the cost side, the wage in i, w_i, is the IIS's marginal cost. No fixed cost is incurred for the IIS. Then, taking into account the FGP's marginal cost, w_j,

profit maximization for the IIS in i yields the following optimal price:

$$p_j^G(\omega) = \frac{w_i + w_j}{1 - \theta(1 - A_i A_j)} \frac{\sigma}{\sigma - 1}, \tag{8}$$

where the superscript G denotes the optimal price level of the final good when the FGP uses global sourcing. Note that the quantity demanded in i and j are consistently denoted by $y_{ji}^G(\omega)$ and $y_{jj}^G(\omega)$, respectively, and then $y_j^G(\omega) = y_{ji}^G(\omega) + y_{jj}^G(\omega)$.

Compared to the well-known optimal price level under perfect contract enforcement, which is $(w_i + w_j)\frac{\sigma}{\sigma-1}$, the price is inflated by $\frac{1}{1-\theta(1-A_iA_j)}$ due to the opportunistic behaviors between the FGP and IIS. However, the opportunism is mitigated by the effective international commercial arbitration regime of country i and j: $\frac{\partial p_j^G(\omega)}{\partial A_i} < 0$, and $\frac{\partial p_j^G(\omega)}{\partial A_j} < 0$. Additionally, $\frac{\partial^2 p_j^G(\omega)}{\partial A_i \partial \theta} < 0$, and $\frac{\partial^2 p_j^G(\omega)}{\partial A_j \partial \theta} < 0$, implying that the beneficial effect of the arbitration-friendly legal system on the price increases with rs intensity, θ.

The FGP expects to receive a lump-sum transfer T based on the ex-ante price from the IIS. As Antràs (2003, 2005) points out, the IISs eventually make a zero profit due to competition between them, implying that the lump-sum transfer T equals the IIS's ex-ante revenue minus variable cost. Taking account of this transfer from the IIS, ex-ante operating profits for the FGP are given by

$$\pi_{ij}(\omega) = (\lambda_i + \lambda_j)(\sigma - 1)^{\sigma-1} \sigma^{-\sigma} (w_i + w_j)^{1-\sigma} [1 - \theta(1 - A_i A_j)]^{\sigma}. \tag{9}$$

Next, consider the case where the FGP in j domestically sources the intermediate input. The profit-maximizing price is

$$p_j^D(\omega) = \frac{2w_j}{1 - \theta(1 - D_j)} \frac{\sigma}{\sigma - 1}, \tag{10}$$

where the superscript D denotes the optimal price level of the final good when the FGP chooses domestic sourcing. Note that the quantity demanded in i and j are consistently indexed by $y_{ji}^D(\omega)$ and $y_{jj}^D(\omega)$, respectively, and then $y_j^D(\omega) = y_{ji}^D(\omega) + y_{jj}^D(\omega)$. Similar to the case of the global sourcing, $\frac{\partial p_j^D(\omega)}{\partial D_j} < 0$, and $\frac{\partial^2 p_j^D(\omega)}{\partial D_j \partial \theta} < 0$. The ex-ante operating profits based

on this price for the FGP are equal to

$$\pi_{jj}(\omega) = (\lambda_i + \lambda_j)(\sigma - 1)^{\sigma-1}\sigma^{-\sigma}(2w_j)^{1-\sigma}\left[1 - \theta(1 - D_j)\right]^{\sigma}. \tag{11}$$

Concerning the choice between the global and domestic sourcing, a mixed equilibrium where both global and domestic sourcing arise in j exists only if $\pi_{ij}(\omega) = \pi_{jj}(\omega)$, implying that $\left(\frac{2w_j}{w_i+w_j}\right)^{1-\frac{1}{\sigma}} = \frac{1-\theta(1-D_j)}{1-\theta(1-A_iA_j)}$. Since this condition is generally not met, I focus on two pervasive cases: the FGP in a country chooses either global or domestic sourcing.

Let us consider the case where the FGP in j chooses to globally source the intermediate input from the IIS in i. This happens if $\pi_{ij}(\omega) > \pi_{jj}(\omega)$, implying that

$$\left(\frac{2w_j}{w_i + w_j}\right)^{1-\frac{1}{\sigma}} > \frac{1 - \theta(1 - D_j)}{1 - \theta(1 - A_iA_j)}. \tag{12}$$

The left-hand side of this inequality (12) shows the benefit of choosing global sourcing, while the right-hand side shows the opportunity cost under this choice. Specifically, a high wage gap is a benefit as the FGP chooses global sourcing. However, this sourcing occurs at the expense of giving up a higher quality of domestic commercial arbitration regime, which mitigates the parties' opportunism, compared to the foreign commercial arbitration regime. Therefore, global sourcing is preferred to domestic sourcing only when the benefit from the choice outweighs the opportunity cost.[15]

Let $\delta(\cdot) \equiv \left(\frac{2w_j}{w_i+w_j}\right)^{1-\frac{1}{\sigma}} - \frac{1-\theta(1-D_j)}{1-\theta(1-A_iA_j)}$. Then, the FGP in j chooses global sourcing when $\delta(\cdot) > 0$, and the higher $\delta(\cdot)$, the more attractive global sourcing is over domestic sourcing. Since $\frac{2w_j}{w_i+w_j} = \frac{2w_j/w_i}{1+w_j/w_i}$ strictly increases in $\frac{w_j}{w_i}$, the attractiveness of the global sourcing increases as $\frac{w_j}{w_i}$ rises.

Additionally, $\frac{\partial\delta(\cdot)}{\partial\theta} < 0$ with the assumption that $D_i \geq A_i$. This implies that the FGP will

[15]The condition under which global sourcing is chosen over domestic sourcing by j's FGP, $\pi_{ij}(\omega) > \pi_{jj}(\omega)$, also implies the following inequality: $A_iA_j > \frac{(1-\theta+\theta D_j)\left(\frac{w_i+w_j}{2w_j}\right)^{1-\frac{1}{\sigma}}-1}{\theta} + 1$. Since $\frac{w_i+w_j}{2w_j}$ strictly increases in $\frac{w_i}{w_j}$, the right-hand side captures the wage benefit of domestic sourcing, while considering the mitigation of opportunism through D_j. Thus, only when A_iA_j is greater than the benefit of domestic sourcing, under the assumption of $D_j \geq A_j$, j's FGP chooses global sourcing. To put it differently, for the FGP to choose global sourcing, the wage ratio, $\frac{w_j}{w_i}$, should be great enough to cover a lower mitigation of opportunism by $A_iA_j(< D_j)$ in global sourcing than in domestic sourcing, which is implied by equation (12).

outsource less intermediate input for which rs transactions are required to a higher degree because the component share that is vulnerable to the parties' opportunistic behaviors rises more in global sourcing due to the lower quality of arbitration regimes than in domestic sourcing.

Regarding the quality of the international commercial arbitration regime, $\frac{\partial\delta(\cdot)}{\partial A_i} > 0$, and $\frac{\partial\delta(\cdot)}{\partial A_j} > 0$. A higher A_i or A_j attracts more global sourcing. Additionally, $\frac{\partial^2\delta(\cdot)}{\partial A_i\partial\theta} > 0$, and $\frac{\partial^2\delta(\cdot)}{\partial A_j\partial\theta} > 0$.[16] That is, the positive effect of international arbitration regimes of each country on the attractiveness of global sourcing rises with θ. This is because as the greater part of producing the intermediate input is vulnerable to opportunism, the effect of a rise in A_i or A_j on the mitigation of the risk becomes higher. It is straightforward to show that the effect of D_j on $\delta(\cdot)$ is the opposite: $\frac{\partial\delta(\cdot)}{\partial D_j} < 0$, and $\frac{\partial^2\delta(\cdot)}{\partial D_j\partial\theta} < 0$. That is, a higher quality of domestic arbitration regime decreases the attractiveness of the global sourcing, and this impact increases with θ.

Turning to the choice of the FGP in i, it chooses domestic sourcing when the FGP in j chooses global sourcing based on the following Proposition 1.

Proposition 1. *When the FGP in one country chooses global sourcing, the FGP in the other country chooses domestic sourcing.*

Proof. The first piece of this proof comes from the fact that $\frac{2w_i}{w_i+w_j} < \frac{w_i+w_j}{2w_j}$. This is easily shown by replacing $\frac{w_j}{w_i}$ with $x(>0)$; $\frac{w_i+w_j}{2w_j} - \frac{2w_i}{w_i+w_j} = \frac{1+x}{2x} - \frac{2}{1+x} = \frac{(x-1)^2}{2x(x+1)} > 0$. Next, inequality (12) implies that $\left(\frac{w_i+w_j}{2w_j}\right)^{1-\frac{1}{\sigma}} < \frac{1-\theta(1-A_iA_j)}{1-\theta(1-D_j)}$. Under the assumption that $D_i \geq A_i$ and $A_j \in (0,1)$, $A_iA_j < D_i$, which implies that $\frac{1-\theta(1-A_iA_j)}{1-\theta(1-D_j)} < \frac{1-\theta(1-D_i)}{1-\theta(1-D_j)}$. Addition-

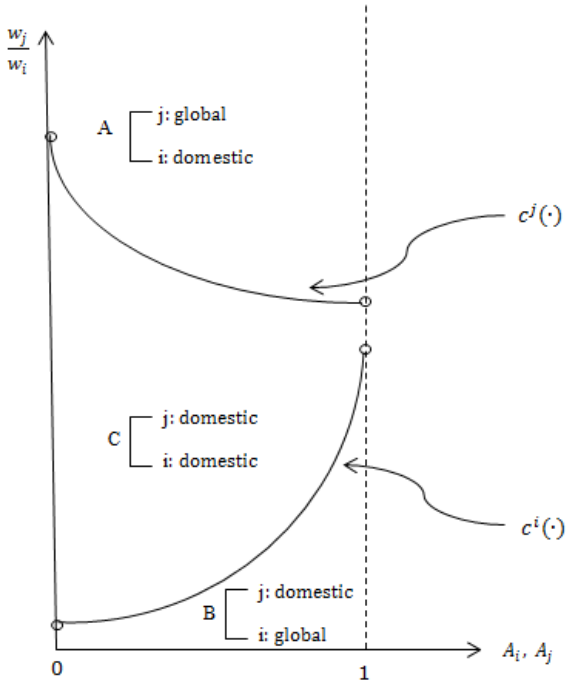
[16]The proof of these positive joint effects are as follows. $\frac{\partial^2\delta(\cdot)}{\partial A_i\partial\theta} = A_j(1-\theta+\theta A_iA_j)\left[(1-2\theta+2\theta D_j)(1-\theta+\theta A_iA_j)+2\theta(1-\theta+\theta D_j)(1-A_iA_j)\right]/(1-\theta+\theta A_iA_j)^4$. Let the part within the bracket in the numerator be B. Then, since $(1-\theta+\theta D_j) > (1-\theta+\theta A_iA_j)$ with the assumption that $D_j \geq A_j$ and $A_i \in (0,1)$, $B > (1-2\theta+2\theta D_j)(1-\theta+\theta A_iA_j)+2\theta(1-\theta+\theta A_iA_j)(1-A_iA_j)$. Then, the right-hand side can be written as $(1-\theta+\theta A_iA_j)\left[1+2\theta(D_j-A_iA_j)\right]$, which is greater than 0. Thus, B is positive, and hence $\frac{\partial^2\delta(\cdot)}{\partial A_i\partial\theta}$ is positive. With the same method, $\frac{\partial^2\delta(\cdot)}{\partial A_j\partial\theta}$ is positive as well.

ally, under the assumption that $D_j \geq A_j$ and $A_i \in (0,1)$, $A_iA_j < D_j$, which implies that $\frac{1-\theta(1-D_i)}{1-\theta(1-D_j)} < \frac{1-\theta(1-D_i)}{1-\theta(1-A_iA_j)}$. Taken together, it is straightforward to draw the following inequality under which the FGP in i chooses the domestic sourcing: $\left(\frac{2w_i}{w_i+w_j}\right)^{1-\frac{1}{\sigma}} < \frac{1-\theta(1-D_i)}{1-\theta(1-A_iA_j)}$. Therefore, $\left(\frac{2w_j}{w_i+w_j}\right)^{1-\frac{1}{\sigma}} > \frac{1-\theta(1-D_j)}{1-\theta(1-A_iA_j)}$ implies that $\left(\frac{2w_i}{w_i+w_j}\right)^{1-\frac{1}{\sigma}} < \frac{1-\theta(1-D_i)}{1-\theta(1-A_iA_j)}$. To put it into words, the FGP in i chooses domestic sourcing when the FGP in j chooses global sourcing. Lastly, by switching i to j and j to i in inequality (12) and by following the same logic, the following statement is derived: the FGP in j chooses domestic sourcing when the FGP in i chooses global sourcing.

Intuitively, when a country's wage is high enough relative to the source country's wage to offset the excess cost of imperfect international arbitration regimes over the domestic one, the country's FGP chooses global sourcing. However, with the same condition, the source country's FGP chooses domestic sourcing because its wage relative to destination country's wage is not great enough to cover the higher cost of the imperfect international arbitration regime.

The cutoff condition for the choice of sourcing mode for country j's FGP is, by rearranging $\delta(\cdot) = 0$, $\frac{w_j}{w_i} = c^j(\cdot) \equiv \left[2\left(\frac{1-\theta+\theta A_iA_j}{1-\theta+\theta D_j}\right)^{\frac{\sigma}{\sigma-1}} - 1\right]^{-1}$. To see the shape of this cutoff function in terms of A_j, let us only consider $h^j(\cdot) \equiv (1-\theta+\theta A_iA_j)^{-\frac{\sigma}{\sigma-1}}$, which determines whether $c^j(\cdot)$ is concave upward or downward on A_j. Note that a firm's choice of sourcing mode based on the cutoff conditions with respect to D_i and D_j is discussed in Appendix B. Since $\frac{\partial h^j(\cdot)}{\partial A_j} < 0$ and $\frac{\partial^2 h^j(\cdot)}{\partial A_j^2} > 0$, the cutoff function is downward-sloping and convex on A_j as shown in Figure 1. The decreasing pattern over A_j implies that as A_j rises, $\frac{w_j}{w_i}$, which leads to the indifferent choice between the two sourcing modes, decreases. In other words, the fall in the cost of global sourcing with A_j makes the FGP choose global sourcing, even when the benefits of global sourcing, $\frac{w_j}{w_i}$, fall. Under this falling cutoff curve, when $\frac{w_j}{w_i}$ is above the cutoff curve for each A_j, j's FGP chooses global sourcing, and i's FGP chooses domestic sourcing, which is represented by region A in the same Figure. This discussion and the

Figure 1: Choice of Sourcing Mode



following discussion remain the same with A_i.

Turning to the perspective of the FGP in i, its cutoff curve is shown as follows: $\frac{w_j}{w_i} = c^i(\cdot) \equiv \left[2\left(\frac{1-\theta+\theta A_i A_j}{1-\theta+\theta D_i}\right)^{\frac{\sigma}{\sigma-1}} - 1\right]$. Let us only consider $h^i(\cdot) \equiv (1-\theta+\theta A_i A_j)^{\frac{\sigma}{\sigma-1}}$, which determines the shape of $c^i(\cdot)$ over A_j. Since $\frac{\partial h^i(\cdot)}{\partial A_j} > 0$ and $\frac{\partial^2 h^i(\cdot)}{\partial A_j^2} > 0$, $c^i(\cdot)$ is upward-sloping and convex on A_j, as shown in Figure 1. This increasing pattern (i.e., decreasing $\frac{w_i}{w_j}$) of the cutoff curve over A_j implies that the decreasing cost of international arbitration with A_j makes $\frac{w_i}{w_j}$, which generates the indifferent choice between the two sourcing modes, fall. Then, the FGP finds it profitable to choose global sourcing only when the combination of A_j and $\frac{w_j}{w_i}$ is below the cutoff curve, as presented in region B in Figure 1.

Next, consider the case where the FGP in j chooses domestic sourcing. In this case, the FGP in i chooses domestic sourcing only if $\frac{w_j}{w_i} > \left[2\left(\frac{1-\theta+\theta A_i A_j}{1-\theta+\theta D_i}\right)^{\frac{\sigma}{\sigma-1}} - 1\right]$. Conversely, in the case where the FGP in i chooses domestic sourcing, the FGP in j chooses domestic sourcing only if $\frac{w_j}{w_i} < \left[2\left(\frac{1-\theta+\theta A_i A_j}{1-\theta+\theta D_j}\right)^{\frac{\sigma}{\sigma-1}} - 1\right]^{-1}$. The region that meets these two conditions is represented by region C in the same Figure, where all FGPs in i and j choose domestic

sourcing.

Note that, when A_j or A_i is 1, $c^j(\cdot)$ should be greater than or equal to $c^i(\cdot)$. Otherwise, the two cutoff curves intersect, creating a region in which the choices made by the FGPs in i and j contradict each other. Note, also, that if $\left[2\left(\frac{1-\theta+\theta A_i A_j}{1-\theta+\theta D_j}\right)^{\frac{\sigma}{\sigma-1}}-1\right]^{-1}$ is less than or equal to 0, the FGP of j chooses global sourcing since $\frac{w_j}{w_i}$ on j's FGP's cutoff curve is always less than $\frac{w_j}{w_i}$, which is greater than 0. Conversely, if $\left[2\left(\frac{1-\theta+\theta A_i A_j}{1-\theta+\theta D_i}\right)^{\frac{\sigma}{\sigma-1}}-1\right]$ is less than or equal to 0, i's FGP chooses domestic sourcing since $\frac{w_j}{w_i}$ on i's FGP's cutoff curve is less than $\frac{w_j}{w_i}$, which is greater than 0. For simplicity, I only consider the cases in which a cutoff curve does not intersect the horizontal axis. This requires that the minimum value of $c^i(\cdot)$ with A_j or A_i of 0 should be greater than or equal to 0, implying that $\left(\frac{1-\theta}{1-\theta+\theta D_i}\right)^{\frac{\sigma}{\sigma-1}} \geq \frac{1}{2}$.

These two cutoff conditions for the choice of sourcing mode for j and i show that the region where the FGP in a country chooses global sourcing is expanded as both A_i and A_j rise. This implies the importance of having high-quality international commercial arbitration regimes in both countries to take advantage of less expensive labor for production.

To summarize, there are three cases in this model: two cases where the FGPs in i and j choose a different mode of sourcing and one case where all FGPs in both countries choose domestic sourcing. Since the first two cases are symmetric, I only consider the case where the FGP in j chooses global sourcing, while the FGP in i chooses domestic sourcing, in the following Section 4. The third case is discussed in Appendix A.

4 General Equilibrium

4.1 The Coexistence of Global and Domestic Sourcing

Under the choice of the global and domestic sourcing made by the FGPs in j and i, respectively, λ, expressed in equation (3), is specified as follows:

$$\lambda_j = \frac{E_j}{\int_{\omega=0}^{n_i} p_i^D(\omega)^{1-\sigma} d\omega + \int_{\omega=0}^{n_j} p_j^G(\omega)^{1-\sigma} d\omega}, \quad \lambda_i = \frac{E_i}{\int_{\omega=0}^{n_j} p_j^G(\omega)^{1-\sigma} d\omega + \int_{\omega=0}^{n_i} p_i^D(\omega)^{1-\sigma} d\omega}. \quad (13)$$

By income balance condition, $E_j = w_j L_j$, and $E_i = w_i L_i$, where L_j and L_i are the labor endowment of country j and i, respectively.

Let us consider i's labor market. In i, some IISs produce the intermediate input for i's FGP, and the rest of IISs produce it for j's FGP. Thus, in i, the number of IISs, each of which produces $x_{ij}(\omega)$ units of x, is equal to the number of FGPs in j, n_j, and the number of IISs, each of which produces $x_{ii}(\omega)$ units of x, equals the number of FGPs in i, n_i. Additionally, for the sales of the final good, $y_i^D(\omega)$, both variable and fixed costs are incurred by the n_i FGPs. The fixed cost includes innovation cost such as the number of researchers and designers developing the product. Then, the labor market clearing condition in i imposes that $x_{ij}(\omega)n_j + x_{ii}(\omega)n_i + y_i^D(\omega)n_i + f_i n_i = L_i$. Since $x_{ij}(\omega) = y_j^G(\omega) = y_{ji}^G(\omega) + y_{jj}^G(\omega)$, and $x_{ii}(\omega) = y_i^D(\omega) = y_{ij}^D(\omega) + y_{ii}^D(\omega)$, the labor market clearing condition can be written as follows:

$$(\lambda_i + \lambda_j)\left(\frac{\sigma-1}{\sigma}\right)^{\sigma}\left[(w_i+w_j)^{-\sigma}(\theta A_i A_j + 1 - \theta)^{\sigma} n_j + 2(2w_i)^{-\sigma}(\theta D_i + 1 - \theta)^{\sigma} n_i\right] + f_i n_i = L_i. \tag{14}$$

On the contrary, in j, no IIS is demanded since n_j FGPs source x from i. Considering the variable and fixed cost for the sales of the final good, $y_j^G(\omega)$, the labor market clearing condition in j dictates that $y_j^G(\omega)n_j + f_j n_j = L_j$. Using $y_j^G(\omega) = y_{ji}^G(\omega) + y_{jj}^G(\omega)$, this condition can be expressed as follows:

$$(\lambda_i + \lambda_j)\left(\frac{\sigma-1}{\sigma}\right)^{\sigma}(w_i+w_j)^{-\sigma}(\theta A_i A_j + 1 - \theta)^{\sigma} n_j + f_j n_j = L_j. \tag{15}$$

The zero profit condition leading to the free entry of firms requires the operating profits for the FGP to be equal to the fixed costs. Thus, $\pi_{ij}(\omega) = w_j f_j$, and $\pi_{ii}(\omega) = w_i f_i$, implying

$$(\lambda_i + \lambda_j)(\sigma-1)^{\sigma-1}\sigma^{-\sigma}(w_i+w_j)^{1-\sigma}\left[1 - \theta(1 - A_i A_j)\right]^{\sigma} = w_j f_j, \tag{16}$$

$$(\lambda_i + \lambda_j)(\sigma-1)^{\sigma-1}\sigma^{-\sigma}(2w_i)^{1-\sigma}\left[1 - \theta(1 - D_i)\right]^{\sigma} = w_i f_i. \tag{17}$$

Then, these two zero profit conditions yield the implicit function of the equilibrium wage

ratio:

$$\frac{w_j}{w_i}\left[\frac{1}{2}\left(1+\frac{w_j}{w_i}\right)\right]^{\sigma-1}=\left(\frac{\theta A_i A_j+1-\theta}{\theta D_i+1-\theta}\right)^{\sigma}\frac{f_i}{f_j}. \tag{18}$$

Meanwhile, j's zero profit condition in equation (16) and labor market clearing condition in j in equation (15) pin down n_j as follows:

$$n_j=\frac{L_j}{f_j}\left[1-\frac{\sigma-1}{\frac{w_i}{w_j}+\sigma}\right]. \tag{19}$$

In addition, i's zero profit condition in (17), the labor market clearing conditions in i and j in equations (14) and (15), and n_j in equation (19) pin down n_i as follows:

$$n_i=\frac{L_i}{f_i}\left[\frac{L_j(\sigma-1)^2}{\frac{w_i}{w_j}+\sigma}+1\right]^{-1}. \tag{20}$$

Thus, once $\frac{w_j}{w_i}$ is implicitly determined by the parameters in equation (18), n_j and n_i are pinned down. The reason $\frac{w_j}{w_i}$ is determined independently of n_j and n_i is that both countries' FGPs produce the final good, which is consumed in both countries. Hence, the operating profits for the FGPs in i and j are a function of $(\lambda_i+\lambda_j)$, which is canceled out to draw the implicit function of the wage ratio.

Suppose that a change in a parameter leads w_i to fall while leading w_j to stay the same, which causes a rise in $\frac{w_j}{w_i}$. Then, n_j and n_i fall by equations (19) and (20). This result can be examined using the two labor market clearing conditions. The FGP in j can produce more y with a lower variable cost. That is, $y_j^G(\omega)(=x_{ij}(\omega))$ rises. Since this higher production exhausts more labor per firm than before in selling the final good, n_j decreases with the fixed labor endowment in j. Using j's labor market clearing condition, $y_j^G(\omega)n_j+f_jn_j=L_j$, the rise in $y_j^G(\omega)$ decreases n_j. This fall further implies that, in j's labor market clearing condition, $y_j^G(\omega)n_j$ rises since f_jn_j falls. Meanwhile, the fall in w_i raises the production for $y_i^D(\omega)=x_{ii}(\omega)$ due to lowered variable cost, which exhausts more labor per firm in i than before. This means a rise in $x_{ii}(\omega)$ $(=y_i^D(\omega))$ in the following i's labor market clearing condition, $x_{ij}(\omega)n_j+x_{ii}(\omega)n_i+y_i^D(\omega)n_i+f_in_i=L_i$. Combining this result with the rise in

$y_j^G(\omega)n_j = x_{ij}(\omega)n_j$, n_i should decrease with the fixed L_i.

4.1.1 Wage Ratio and Commercial Arbitration Regimes

The effects of A_i, A_j, and D_i on the wage ratio are analyzed in the implicit function of $\frac{w_j}{w_i}$, expressed in equation (18). Since the left-hand side (LHS) in the equation is strictly increasing in $\frac{w_j}{w_i}$, the effects are examined by looking at how the right-hand side (RHS) responds to changes in those parameters. Let the RHS be a function of $q(\cdot)$. Then, it is straightforward to show that $\frac{\partial q(\cdot)}{\partial A_i}$ and $\frac{\partial q(\cdot)}{\partial A_j}$ are greater than 0, while the signs for $\frac{\partial^2 q(\cdot)}{\partial A_i \partial \theta}$ and $\frac{\partial^2 q(\cdot)}{\partial A_j \partial \theta}$ are ambiguous. Similarly, $\frac{\partial q(\cdot)}{\partial D_i}$ is less than 0, while the sign for $\frac{\partial^2 q(\cdot)}{\partial D_i \partial \theta}$ is ambiguous. It is also straightforward to show that $\frac{\partial q(\cdot)}{\partial \theta} < 0$ by using the assumption that $D_i \geq A_i$. These results imply the following Proposition:

Proposition 2. *When the FGP in j chooses global sourcing, and the FGP in i chooses domestic sourcing, the wage ratio, $\frac{w_j}{w_i}$, increases with each country's quality of international commercial arbitration regimes. The wage ratio additionally decreases with the source country's quality of domestic commercial arbitration regimes and the rs intensity of the intermediate input. That is, $\frac{\partial\left(\frac{w_j}{w_i}\right)}{\partial A_i} > 0$, $\frac{\partial\left(\frac{w_j}{w_i}\right)}{\partial A_j} > 0$, $\frac{\partial\left(\frac{w_j}{w_i}\right)}{\partial D_i} < 0$, and $\frac{\partial\left(\frac{w_j}{w_i}\right)}{\partial \theta} < 0$.*

Since the wage ratio is derived by the two zero profit conditions for the FGPs in i and j, these effects are analyzed by looking at the balance between the revenue and cost, i.e., the revenue should be the sum of the fixed cost and variable cost. When A_i or A_j rises, the revenue for j's FGP relative to the revenue for i's FGP rises. Then, the total costs in value terms, including the variable and fixed cost, for j relative to i are also increased by the zero profit conditions. Thus, the wage ratio rises as A_i or A_j increases. In contrast, when D_i rises, the relative revenue for the FGP in j to i falls, which leads to a decrease in the wage ratio.

The increase in the wage ratio with A_i and A_j implies that the choices of sourcing modes

by the FGPs in both countries are not flipped as A_i or A_j rises through general equilibrium effects in region A in Figure 1. Similarly, the choices of the sourcing modes by the FGPs are not flipped in region B since $\frac{w_j}{w_i}$ falls with A_i or A_j. Note that in region C, the wage ratio does not depend on A_i and A_j since global sourcing is not chosen. Thus, in this region, only partial equilibrium effects occur as A_i or A_j approaches the cutoffs $c^j(\cdot)$ and $c^i(\cdot)$ given the fixed level of $\frac{w_j}{w_i}$. That is, as A_i or A_j increases, the choice of sourcing mode by j's FGP is more likely to be changed from domestic sourcing in region C to global sourcing in region A. Additionally, the choice of sourcing mode by i's FGP is more likely to be flipped from domestic sourcing in region C to global sourcing in region B, while j's FGP constantly chooses domestic sourcing.

Lastly, $\frac{\partial\left(\frac{w_j}{w_i}\right)}{\partial\theta}$ is consistently negative, which implies that as the risk of opportunism increases with θ, the revenue of j's FGP falls relative to i's FGP. Even though the revenues for both countries' FGPs fall, the higher quality of domestic arbitration regimes relative to international arbitration regimes mitigates opportunism in domestic sourcing more than global sourcing. This leads to the asymmetric impact on the revenues of FGPs in i and j.

4.1.2 Trade Flows, Welfare, and Commercial Arbitration Regimes

Let M_{ij} be the total trade flows of x from i to j. This is also interpreted as the total sales of x, produced by country i's IISs, in j. M_{ij} is calculated by the revenue for the IIS in i multiplied by n_j: $(\theta A_i A_j + 1 - \theta)\left[p_j^G(\omega)y_{ji}^G(\omega) + p_j^G(\omega)y_{jj}^G(\omega)\right]n_j$. Similarly, M_{ii}, the total domestic trade flows of x in i, which is also interpreted as total sales of x in i, is calculated by $(\theta D_i + 1 - \theta)\left[p_i^D(\omega)y_{ij}^D(\omega) + p_i^D(\omega)y_{ii}^D(\omega)\right]n_i$. Then, using the equilibrium wage ratio in equation (18), the relative trade flows of x, $\frac{M_{ij}}{M_{ii}}$, is summarized as $\frac{n_j w_j}{w_i}\frac{f_j}{f_i}\frac{1}{n_i}$. Using the equilibrium n_j and n_i, expressed in equation (19) and (20), respectively, $\frac{M_{ij}}{M_{ii}}$ is further simplified as a function of the wage ratio as follows:

$$\frac{M_{ij}}{M_{ii}} = \frac{L_j}{L_i}\left(\frac{1+\frac{w_j}{w_i}}{\sigma+\frac{w_i}{w_j}}\right)\left[L_j\frac{(\sigma-1)^2}{\frac{w_i}{w_j}+\sigma}+1\right]. \tag{21}$$

Thus, this relative global sourcing increases with L_j while decreasing with L_i.

The responses of $\frac{M_{ij}}{M_{ii}}$ to the changes in the main variables are consistent with the responses of $\frac{w_j}{w_i}$ to the corresponding changes since relative global sourcing is a strictly increasing function of the wage ratio. Accordingly, $\frac{M_{ij}}{M_{ii}}$ rises with A_i, A_j, while it falls with D_i and θ. The sign for $\frac{\partial^2\left(\frac{M_{ij}}{M_{ii}}\right)}{\partial A_i \partial\theta}$, $\frac{\partial^2\left(\frac{M_{ij}}{M_{ii}}\right)}{\partial A_j \partial\theta}$, and $\frac{\partial^2\left(\frac{M_{ij}}{M_{ii}}\right)}{\partial D_i \partial\theta}$ are ambiguous. Additionally, $\frac{M_{ij}}{M_{ii}}$ rises with f_i, while it falls with f_j.

Next, let Y_{ij} be the total trade flows for the final good from i to j. This is also interpreted as the total sales of the final good, produced by country i's FGPs, in j. Y_{ij} is calculated by $n_i y_{ij}^D(\omega) p_i^D(\omega)$. Similarly, Y_{jj}, the total sales of y in j, is calculated by $n_j y_{jj}^G(\omega) p_j^G(\omega)$. Then, Y_j, the value of the final goods that the consumers in j enjoy, is the sum of Y_{ij} and Y_{jj}, i.e., $Y_j = Y_{ij} + Y_{jj}$. In the same way, $Y_i = Y_{ji} + Y_{ii}$, where $Y_{ji} = n_j y_{ji}^G(\omega) p_j^G(\omega)$ and $Y_{ii} = n_i y_{ii}^D(\omega) p_i^D(\omega)$. Then, the international sales of the final good relative to the domestic sales by country i's FGPs, i.e., $\frac{Y_{ij}}{Y_{ii}}$, is $\frac{\lambda_j}{\lambda_i}$ because the price indexes of the two countries are the same in the absence of transport cost. This may be further expressed as $\frac{w_j}{w_i}\frac{L_j}{L_i}$. $\frac{Y_j}{Y_i}$ may also be expressed as $\frac{w_j}{w_i}\frac{L_j}{L_i}$. Therefore, the signs for $\frac{\partial\left(\frac{Y_{ij}}{Y_{ii}}\right)}{\partial A_i}$ and $\frac{\partial\left(\frac{Y_j}{Y_i}\right)}{\partial A_i}$ are positive, while the signs for $\frac{\partial\left(\frac{Y_{ij}}{Y_{ii}}\right)}{\partial D_i}$, $\frac{\partial\left(\frac{Y_{ij}}{Y_{ii}}\right)}{\partial\theta}$, $\frac{\partial\left(\frac{Y_j}{Y_i}\right)}{\partial D_i}$, and $\frac{\partial\left(\frac{Y_j}{Y_i}\right)}{\partial\theta}$ are negative. Note that A_j's effects are the same as the A_i's effects. The differential arbitration effects with respect to θ are ambiguous, as in the case of $\frac{w_j}{w_i}$.

The welfare in j, denoted by U_j, is measured by E_j divided by P_j. P_j is presented in equation (3). Since the price index of country i and j are the same, $\frac{U_j}{U_i} = \frac{w_j}{w_i}\frac{L_j}{L_i}$. Therefore, the welfare ratio, $\frac{U_j}{U_i}$, rises as A_i or A_j rises, while this ratio falls as D_i or θ increases.[17] Again, the differential arbitration effect across θ is ambiguous.

These arbitration and rs intensity effects on trade flows of intermediate inputs and final goods and welfare are summarized as follows:

[17] Absolute levels of the variables, such as U_i and U_j, are not analytically pinned down. This is because the parameters determine wage ratio rather than independently determining each wage level in each country. This stems from the fact that both countries' labor is used as a variable cost for the production of y. Thus, the effect of a change in parameter on an absolute level of a variable, such as $\frac{\partial U_i}{\partial A_i}$, is ambiguous.

Proposition 3. *When the FGP in j chooses global sourcing, and the FGP in i chooses domestic sourcing,* $\frac{\partial\left(\frac{M_{ij}}{M_{ii}}\right)}{\partial A_i} > 0$, $\frac{\partial\left(\frac{Y_{ij}}{Y_{ii}}\right)}{\partial A_i} > 0$, $\frac{\partial\left(\frac{Y_j}{Y_i}\right)}{\partial A_i} > 0$, *and* $\frac{\partial\left(\frac{U_j}{U_i}\right)}{\partial A_i} > 0$. *The direction of each response stays the same according to a rise in A_j, while it is the opposite according to a rise in D_i or θ.*

4.2 Summary of the Main Theoretical Results

To summarize the main theoretical results of commercial arbitration regimes and the impact of rs intensity on relative global sourcing patterns, I show Table 1, which lists the directions of these impacts, while accounting for a firm's entry decision.

I consider both partial and general equilibrium effects. In partial equilibrium, I assume that the wage ratio is exogenous to the firm. Firms choose global sourcing over domestic sourcing in this scenario. The directions of these effects are determined by $\delta(\cdot)$ function, which measures the attractiveness of global sourcing relative to domestic sourcing. This function is from the condition under which global sourcing is chosen over domestic sourcing by j's FGP, expressed as inequality (12). In general equilibrium, I allow firms to respond to the wage ratio when the quality of arbitration regimes changes. The directions of these effects are based on equations (18) and (21), the equations for the wage ratio and relative global sourcing, respectively.

Concerning an increase in A_i or A_j, the general equilibrium effects do not flip the sourcing modes of the firms, as discussed in Section 4.1.1. Only the partial equilibrium effects change the sourcing modes of the firms. Conversely, regarding an increase in D_i or D_j, by both partial and general equilibrium effects, the firms switch sourcing modes, as discussed in Appendix B. However, as explained in this Appendix, the firms are more likely to choose domestic sourcing as D_i or D_j increases, even when considering general equilibrium effects. As such, the impact of an increase in D_i or D_j on relative global sourcing through the firms' shifts in sourcing modes, channeled by general equilibrium effects, is consistent with the prediction in Table 1. This implies that this shift in sourcing modes through the general

Table 1: The directions of the main variables' effects on M_{ij}/M_{ii}

Two situations determining M_{ij}/M_{ii} $\Rightarrow$	1. j's FGP's entry into global sourcing	2. M_{ij}/M_{ii} upon j's FGP's entry into global sourcing
Partial or general equil. $\Rightarrow$	Partial equilibrium effects	General equilibrium effects
Related eq. or ineq. $\Rightarrow$	$\delta(.)$ from ineq. (12)	Eqs. (18) and (21)
θ	$-$	$-$
A_i	$+$	$+$
A_j	$+$	$+$
D_j	$-$	n/a
D_i	n/a	$-$
$A_i\theta$	$+$	ambiguous
$A_j\theta$	$+$	ambiguous
$D_j\theta$	$-$	n/a
$D_i\theta$	n/a	ambiguous

Notes: The effect of a variable that does not exist in a related equation is reported as n/a. For example, D_j is not in the equation for M_{ij}/M_{ii}. This is because this equation characterizes relative global sourcing after j's FGP chooses global sourcing and i's FGP chooses domestic sourcing.

equilibrium effects reinforces the predictions regarding D_i and D_j in this table. Therefore, the predictions in this table provides sufficient information to summarize the effects of the main variables on sourcing patterns.

Let us consider the individual effects of the main variables. Taking into account both the partial and general equilibrium effects, relative global sourcing increases with A_i or A_j, while decreasing with D_i or D_j. θ also decreases relative global sourcing, capturing that domestic sourcing is less exposed to opportunism than global sourcing through a higher quality of domestic arbitration regimes than international ones.

Next, consider the first three interaction terms, $A_i\theta$, $A_j\theta$, and $D_j\theta$. Their partial equilibrium effects show that global sourcing is increasingly attractive as A_i and A_j grow and D_j shrinks. These effects are larger as the risk of opportunism, represented by θ, grows. The interaction terms of $A_i\theta$, $A_j\theta$, and $D_i\theta$ additionally affect $\frac{M_{ij}}{M_{ii}}$ through general equilibrium impacts after j's FGP chooses global sourcing and i's FGP chooses domestic sourcing.

Taken together, the directions of the individual terms' effects on $\frac{M_{ij}}{M_{ii}}$ are clear. Among the four joint effects, the direction of the effect of $D_j\theta$ is clearly expected since it affects relative global sourcing only through a firm's entry decision. The directions of the effects of

$A_i\theta$, $A_j\theta$, and $D_i\theta$ are ambiguous through general equilibrium effects.

5 Empirical Specification

In this section, and the following sections, I focus on empirically examining the effects of the quality of arbitration regimes and rs intensity on relative global sourcing patterns, $\frac{M_{ij}}{M_{ii}}$. Since global sourcing patterns, described in equation (21), are determined upon j's FGP's entry into global sourcing, the entry decision, as shown in Table 1, is also considered for the empirical analysis.

The estimation equation is as follows:

$$\begin{aligned} ln\left(\frac{M_{ij}}{M_{ii}}\right)^z =& \beta_0 + \beta_1\theta^z + \beta_2 lnA_i + \beta_3 lnA_j + \beta_4 lnD_i + \beta_5 lnD_j + \beta_6\theta^z lnA_i + \beta_7\theta^z lnA_j \\ &+ \beta_8\theta^z lnD_j + \beta_9\theta^z lnD_i + \beta_{10} ln\left(\frac{w_j}{w_i}\right) + \beta_{11} lnL_i + \beta_{12} lnL_j + \beta_{13} ln\, f_i \\ &+ \beta_{14} ln\, f_j + \Phi^z + \Phi_{ij} + \sum_l \beta_l\, controls + \varepsilon_{ij}^z, \end{aligned} \tag{22}$$

where the superscript z denotes an input industry, and subscript i and j denote the source country and destination country, respectively, and $i \neq j$. Then, $\left(\frac{M_{ij}}{M_{ii}}\right)^z$ is the trade flows of input z from i to j relative to i's local sales of that input. Variable θ^z is my measure of industry-specific rs intensity, which indicate the degree to which rs transactions are required for the IISs to produce z. Variables A_i and D_i are country i's quality of international and domestic commercial arbitration regimes. Variables A_i, A_j, D_i, D_j, θ^z, and their interaction terms are the main variables, and thus the empirical results will be analyzed while focusing on the coefficients of β_1 through β_9.

Variables w_i, L_i,and f_i denote country i's wage, labor, and fixed cost. The fixed cost is captured by the research and development (R&D) expenditure share of GDP. Variables Φ^z and Φ_{ij} are input-industry and country pair fixed effects, respectively. The input-industry fixed effect Φ^z controls for a possibility that unobservable features of an industry affect sourcing patterns. Note that in the estimation, one input-industry is omitted to avoid the

perfect multicollinearity between θ^z and Φ^z. The country pair fixed effect Φ_{ij} captures the average difference in trade flows between country pairs regardless of who exports or imports a good. In a country pair in Φ_{ij}, which country is an exporter or importer does not matter. For example, a pair of countries (Korea, US) are treated as the same regardless of whether Korea is an exporter or importer. Thus, the number of omitted country pairs in the estimation is the number of country-level variables divided by 2.

The set of control variables, such as real GDP and whether a country is landlocked, is given by *controls*. To control for a possibility that the coefficients on A_i and D_i seize the effects of the quality of other types of institutions, I add formal and informal institutions as a control variable. The former is defined as political constraints on government behavior, and the latter is defined as private constraints on individual behavior following Williamson (2009). In some estimations, the variable of formal institutions is alternately used by the 'rule of law' index in Kaufman et al. (2010), measuring agents' perception about contract enforcement and property rights. Human capital is also considered as a control variable since the coefficients on A_i and D_i could capture the impact of human capital abundance that is a potential determinant for constructing arbitration regimes. Finally, financial development is included as a control variable since financial development can be achieved based on high-quality legal institutions in which arbitration regimes exist. Additionally, IISs in the financially developed countries could export intermediate inputs more by overcoming high fixed costs, and FGPs in the financially developed countries could take better advantage of cheaper inputs from a foreign country by financing the payment more easily.

6 Data and Measures for the Main Variables

In this section, I describe data sources and the measures for the main variables in the empirical analysis. Concerning other variables that are not explained in this section, see Appendix D.

6.1 Sourcing Patterns

Data on trade flows of intermediate inputs are from the 2010 World Input-Output Database (WIOD) constructed by Timmer et al. (2015). I use the trade flows that occur when goods are used as intermediates for an industry, not when goods are used as final goods. The values of the trade flows are expressed in millions of US dollars. The dataset covers all such flows across 40 countries in 35 industries, including the service sector.[18] Even though the number of countries is limited, the quality of this dataset is considered high. It was constructed using official data from statistical institutions, while following the accounting concepts of the International System of National Accounts.

6.2 The Quality of Commercial Arbitration Regimes

To construct the measure of the quality of arbitration regimes, I employ the World Bank Group's Arbitrating and Mediating Disputes (AMD) database that exclusively covers commercial arbitration.[19] The dataset, which was collected in 2009, is based on a survey of legal experts, such as lawyers and law professors in each of the 87 economies.

In accordance with the definition of the quality of arbitration regimes that is made in the theory section, I focus on the enforceability of arbitral awards. As the regimes support a higher enforcement of arbitral awards, the quality of the regimes is considered higher. To capture this quality, three aspects of enforcement regime are considered: enforcement frame, the enforcement regime itself, and the efficiency of enforcement. Specifically, the enforcement frame refers to the basic legal framework that is a prerequisite for the enforcement of arbitral awards. Twelve questions, including whether or not a country enacted a specific statute on commercial arbitration, are chosen to measure the quality of the frame. The enforcement regime measures how directly the enforcement of arbitral awards can occur. Seven ques-

[18] According to Timmer et al. (2015), the 40 countries' GDP accounted for over 85 percent of the world GDP in 2008. Thus, I consider the 40 countries as a world economy.

[19] See Pouget (2013, pp. 5-6).

tions, including whether or not a country ratified the New York Convention, are selected to measure the quality of enforcement regime itself. Lastly, the efficiency of enforcement refers to the degree to which arbitral awards are effectively enforced. Ten questions, including the estimated period from the first hearing of the arbitration tribunal to the rendering of the arbitration award, are selected to capture this efficiency.

Table C.1 in Appendix C lists the selected 29 questions out of the total survey questions.[20] These questions are selected since they are related to the enforcement of arbitral awards.[21] Each question is categorized into the three broad aspects of the enforcement regimes noted above. The second column in the table indicates whether a question is about domestic arbitration (DA) or international arbitration (IA). When a question is related to both domestic and international arbitration, I indicate the question by DA/IA. The third column shows how to score each question.

This scoring system is based on the original scoring system in the AMD database. However, they are not exactly the same in that the answer of N/A scores 0 in my scoring system. Additionally, I change the original scoring system for a few questions. For example, in question 17, I combine two questions and change the score for the answer of "Yes" to each question from 1 to 0.5. This is to prevent double-weighting one subject in that both of them are about the ratification of a convention for the enforcement of arbitral awards. Lastly, I score some questions that were originally not scored in the AMD database. For instance, I score question 15 since this question gives important information to assess the degree of the enforcement of arbitral awards.

How international arbitration is distinguished from domestic arbitration relies on national law (Bergsten 2005, p.12). However, since many states based their arbitration laws on the Model Law, I distinguish international arbitration based on Article 1 (3) of the Model Law

[20]The total survey questions are found at: http://iab.worldbank.org/methodology.

[21]I did not choose some questions that many countries did not answer (or answered N/A) even if they are related to the enforcement matter. Additionally, when some questions are repeated in some sense, I chose the one that is more comprehensive. For example, when a question provides a case study about an arbitration between a multinational and a local company, I chose another question regarding an international arbitration that encompasses the case study scenario. This step is to prevent double-weighting of one question.

that stipulates the conditions under which an arbitration is considered as international. According to the article, if the state that a place of business belongs to is different from the state where the arbitration is situated, then arbitration is international. Meanwhile, according to Article I of the New York Convention, foreign awards are arbitral awards made in the territory of a state other than the one where the recognition and enforcement of such awards are sought. A place where the enforcement of arbitral awards is sought is more likely to be a place of business. Taken together, I consider a foreign arbitral award in the questionnaire as an award that is made in an international arbitration.

A domestic arbitral award can be made in international arbitration since the distinction between foreign and domestic arbitral awards is based on the places where awards are made and sought. Imagine an arbitration case between a local company and a foreign-owned multinational in a local territory. If an arbitral award is made within the local territory, it is considered as a domestic arbitral award. However, the arbitration is considered international. According to Article 1 (3) of the Model law, if the parties have expressly agreed that the subject matter of the arbitration agreement relates to more than one country, the arbitration is international. In fact, according to the survey answers, many countries, including China, Indonesia, the UK, and Vietnam, legally or practically distinguish international arbitration from domestic arbitration based on the parties' nationality, place of permanent residence, or the place of the head office of the parties. Therefore, a domestic arbitral award in the questionnaire is considered as an award that can be made in both international and domestic arbitrations.

To calculate the country-specific aggregate index for each domestic and international arbitration regimes' quality, for each category, I first average the scores for questions indicated by DA and IA, respectively. In the case of questions indicated by DA/IA, the corresponding scores account for the qualities of both domestic and international arbitration. Then, the three country-specific averages for each D and A are averaged again over the categories. Thus, equal weighting is applied for the three categories of enforcement frame, enforcement

Table 2: The index for the quality of commercial arbitration regimes

Country	D	A	Average	Country	D	A	Average
China	0.833	0.843	0.838	Ireland	0.667	0.707	0.687
Romania	0.835	0.753	0.794	Poland	0.678	0.643	0.660
UK	0.778	0.771	0.775	India	0.666	0.648	0.657
Canada	0.789	0.753	0.771	Greece	0.641	0.672	0.657
Mexico	0.761	0.765	0.763	Slovakia	0.639	0.649	0.644
South Korea	0.761	0.721	0.741	Bulgaria	0.640	0.647	0.644
Spain	0.724	0.721	0.722	Japan	0.613	0.649	0.631
Austria	0.733	0.711	0.722	Turkey	0.631	0.575	0.603
Czech Republic	0.735	0.708	0.721	Indonesia	0.613	0.592	0.602
USA	0.733	0.694	0.713	Russia	0.529	0.516	0.523
Brazil	0.724	0.697	0.710				
France	0.733	0.680	0.707	Average	0.639	0.624	0.632

Notes: D and A in the heading denote the quality of domestic and international arbitration regimes, respectively.

regime itself, and the efficiency of enforcement.[22]

Of the 87 countries in the AMD database, 22 countries are in the WIOD, which will be used for the empirical analysis to illustrate the effects of an industry's rs intensity and the quality of commercial arbitration regimes on global sourcing patterns. The indices for the 22 countries are listed in Table 2 in the order of the average of D and A. With these 22 countries, the correlation between the measures of D and A is 0.92.[23] Note that D and A are not comparable in that questions surveyed are not symmetric for domestic and international arbitration. Some questions are only for international arbitration, and there are no corresponding questions for domestic arbitration.

Recall that my measure only captures the matter of enforcement of arbitral awards. Thus, even though my measure is constructed from the World Bank's AMD database, the scores in Table 2 are not perfectly correlated with the AMD scores that analyze arbitration proceedings under these three categories: the strength of laws to regulate arbitrations, the ease of process, and the extent of judicial assistance for arbitration proceedings.[24] For the 87

[22]In Section 7.2, I apply a 0.4:0.4:0.2 weighting scheme for the three categories so that the legal system itself is more weighted than its efficiency.

[23]Section 7.2 shows that this multicollinearity does not cause a serious issue in the estimation.

[24]For example, I exclude the question asking if a party may freely choose the number of arbitrators, which

countries in the database, the correlation between the averages of D and A and the averages of the scores over the AMD three categories is 0.72.

6.3 Relationship-Specificity Intensity

Table 3: A hypothetical example of rs intensity

Input	SITC	1 if input is R, o.w., 0 (A)	Source country	The Chilean firm Input share (B)	(A)×(B)	The French firm Input share (C)	(A)×(C)
Fresh grapes	0579	0	Chile	0.4	0	0.05	0
			France	0.1	0	0.35	0
Sugar	0619	1	Chile	0.1	0.1	0.1	0.1
			France	0.1	0.1	0.1	0.1
Jar	6651	1	Korea	0.1	0.1	0.2	0.2
Pectin	0730	1	Chile	0.1	0.1	0.1	0.1
Metal lid	6996	0	Korea	0.1	0	0.1	0
Sum				(D) ⇒	0.4	(E)⇒	0.5
Output share				(F)⇒	0.6	(G) ⇒	0.4
rs intensity				(D)×(F)+(E)×(G) ⇒			**0.44**

To illustrate the calculation of θ^z, consider a Chilean firm producing a jam gift collection. Now, the firm needs to source a jar of grape jam to complete its jam collection. As Table 3 shows, the firm can source it either from a domestic fruit jam firm or a French jam firm. No matter who produces the jar of grape jam, for the production of one unit of it, a firm is assumed to need Chilean and French fresh grapes and sugar, a Korean glass jar, Chilean pectin, and a Korean metal lid. Following Nunn (2007), who uses the classification of commodities by Rauch (1999), the sugar (SITC 0619), jar (SITC 6651), and pectin (SITC 0730) are classified as R input requiring an rs transaction since they are traded neither on organized exchanges nor reference priced. In contrast, the fresh grapes (SITC 0579) and lid (SITC 6996) are classified as N input since they are reference priced or traded on organized exchanges.[25]

is categorized in the ease of process.

[25]This is based on Rauch's liberal classification that minimizes the number of commodities that are clas-

Even though the two firms use the same inputs, the French jam firm more intensively uses a jar and less intensively uses fresh grapes than the Chilean firm. Then, the sum of the values in column (A) weighted by the input shares in column (B) and column (C) for the Chilean and French firm are 0.4 and 0.5, respectively. Now, assume that only Chile and France produce a jar of grape jam, and their output shares are 0.6 and 0.4, respectively. Then, the rs intensity of a jar of grape jam is summarized as 0.44, which is the sum of 0.4 and 0.5 weighted by the country's output shares, which are 0.6 and 0.4.

To employ this idea of a product-country level to measure industry level rs intensity, let z' be an output industry. Since an rs intensity for an industry is the same regardless of whether the industry is an input industry or an output industry, rs intensity for an input industry z whose industry classification is the same as z' is

$$\theta^z = \theta^{z'} = \sum_i \sum_p \sum_s \xi_i^{z'} \alpha_{si}^{pz'} r_p, \tag{23}$$

where $\alpha_{si}^{pz'}$ is the share of input industry p, sourced from country s, within an output industry z' of country i. The subscript s can be the same as i. $\alpha_{si}^{pz'}$ is calculated by the value of p, sourced from s, in z' divided by the total value of all inputs in z' of country i, using the WIOD in 2010. As a robustness check, I use the 2005 WIOD, which is presented in Section 7.2. $\xi_i^{z'}$ is country i's output share in industry z'. r_p is the degree of relation-specificity for the transaction of input p. Based on the classification of Rauch (1999), if an input is neither traded on organized exchanges nor reference priced, then the input is defined as an input that requires an rs transaction.[26] Rauch's data, which I obtained from his homepage, were revised in 2007.

To construct θ^z, Rauch's data need to be merged with the WIOD. Rauch's commodity codes are organized by the 4-digit Standard International Trade Classification (SITC) revision 2, and the WIOD is listed in the 1-2-digit International Standard Industrial Clas-

sified as differentiated. This classification is listed in the 4-digit Standard International Trade Classification (SITC) revision 2 level.

[26] I use Rauch's liberal classification for the empirical analysis.

sification (ISIC) revision 3. To link the two datasets, I use the concordance between SITC revision 2 and SITC revision 3 and the concordance between SITC revision 3 and ISIC revision 3. The former is given by the United Nations Statistics Division (UNSD), and the latter is from Eurostat.

To build a concordance between the 4-digit SITC revision 2 and 1-2-digit ISIC revision 3, I first truncate the 5-digit SITC codes to the 4-digit in the UNSD's concordance. These truncated SITC codes are mapped to Rauch's data.[27] Then, I link these SITC codes to the codes of the ISIC revision 3 using Eurostat's concordance. The linked set of codes (SITC revision 2, ISIC revision 3) can be repeated since the SITC revision 2 is matched to the ISIC revision 3 through the SITC revision 3. Specifically, there can be two or more identical combinations of codes (SITC revision 2, ISIC revision 3), but each SITC revision 3 code that is matched to each combination is unique. What matters in calculating r_p is the share of SITC revision 2 codes requiring an rs transaction for an ISIC code in the WIOD, regardless of the share of industries listed in SITC revision 3 for an ISIC level. In other words, since the information about rs transactions is listed in the SITC revision 2, the shares of other industry levels for an ISIC code do not matter. Thus, I use the uniquely classified set of industries (SITC revision 2, ISIC revision 3). These 2-4-digit ISIC revision 3 codes are further linked to the 1-2-digit ISIC revision 3 codes in which the trade flows in the WIOD are organized. After adjusting repeated codes for the same reason, I have the uniquely classified set of codes (4-digit SITC revision 2, 2-digit ISIC revision 3).[28] Through these steps, Rauch's commodity codes are mapped to 19 industries of the total of the 35 industries in the WIOD.[29]

Based on this concordance with the 19 industries, $r_p \in (0, 1)$ is built. Specifically, r_p

[27]Due to the truncation to the 4-digit SITC level, some pairs of the set of codes (SITC revision 2, SITC revision 3) are duplicated. Thus, the linking process proceeds after adjusting data in such a way that the set of codes (SITC revision 2, SITC revision 3) is uniquely identified.

[28]In the uniquely classified set of codes (4-digit SITC revision 2, 2-digit ISIC revision 3), an SITC code can be matched to multiple ISIC codes in the WIOD, and an ISIC code can be matched to multiple SITC codes.

[29]This is because most of the ISIC revision 3 codes of service industries such as transport, telecommunications, and education, do not have the matching SITC Revision 2 and Revision 3 codes. The 19 industries are listed in Table 4.

Table 4: Industry-level rs intensity

ISIC code	ISIC description	θ^z
23	Coke, Refined Petroleum and Nuclear Fuel	0.183
AtB	Agriculture, Hunting, Forestry and Fishing	0.249
15t16	Food, Beverages and Tobacco	0.270
E	Electricity, Gas and Water Supply	0.324
24	Chemicals and Chemical Products	0.345
C	Mining and Quarrying	0.377
20	Wood and Products of Wood and Cork	0.396
26	Other Non-Metallic Mineral	0.408
25	Rubber and Plastics	0.409
27t28	Basic Metals and Fabricated Metal	0.416
21t22	Pulp, Paper, Paper , Printing and Publishing	0.449
36t37	Manufacturing, Nec; Recycling	0.481
O	Other Community, Social and Personal Services	0.514
17t18	Textiles and Textile Products	0.519
19	Leather, Leather and Footwear	0.531
71t74	Renting of M&Eq and Other Business Activities	0.575
29	Machinery, Nec	0.598
30t33	Electrical and Optical Equipment	0.662
34t35	Transport Equipment	0.700

is calculated by the number of the SITC codes that require an rs transaction divided by the total number of SITC codes for each 1-2-digit ISIC revision 3 industry. Note that $\alpha_{si}^{pz'}$ is calculated based on the trade flows of the total 35 industries and 40 countries in the WIOD. However, to construct $\theta^{z'}$, I consider only 19 output industries in the WIOD that are used to construct r_p. Otherwise, rs intensity for the industries that are not included in the concordance tend to be significantly lowered. In particular, without this adjustment, $\theta^{z'}$ for the service industries whose inputs are also heavily related to service activity tends to be considerably decreased. This is because most of the service-related input-industries do not exist in the concordance, which makes the values of r_p for those input-industries missing.

This measure is an improvement over the contract intensity measure in Nunn (2007), in that it relaxes his assumption that every country has the same input share for each industry. By using the WIOD, the average industry characteristic of the rs intensity across countries is summarized.

The measure of rs intensity is reported in Table 4.[30] Even though this dataset com-

[30]Even when only using the input share of the US, while not considering the output share of world

prises less disaggregated industry categories, the pattern of rs intensity is quite similar with the contract intensity measure in Nunn (2007). In particular, petroleum, agriculture, hunting, and food industries tend to require less rs transactions, while electrical and transport equipment industries tend to require more rs transactions.

7 Empirical Results

Table 5: Variable definition and descriptive statistics

		1. Country level				
Variable	Variable definition	obs	mean	sd	min	max
lnD_i	Ln qlty. of dom. arbitration regimes	22	-0.359	0.112	-0.636	-0.180
lnA_i	Ln qlty. of int'l arbitration regimes	22	-0.381	0.108	-0.662	-0.170
$lnINF_i$	Ln informal institutions	22	0.479	0.135	0.218	0.708
$lnFOR_i$	Ln formal institutions	22	1.851	0.203	1.099	1.946
$lnROL_i$	Ln rule of law	22	1.089	0.308	0.482	1.477
RD_i	R&D expenditure as a % of GDP	22	1.427	0.951	0.083	3.466
$LLOCKED_i$	Landlocked status	22	0.136	0.351	0	1
$lnPOP_i$	Ln population	22	3.998	1.609	1.497	7.184
$lnHC_i$	Ln index of human capital per person	22	1.063	0.160	0.657	1.286
$lnGDP_i$	Ln GDP	22	13.800	1.370	11.440	16.380
$lnFD_i$	Ln financial development	22	4.290	0.748	3.020	5.392
		2. Importer-exporter level				
$ln(W_j/W_i)$	Ln wage ratio	462	0.000	1.718	-4.154	4.154
		3. Industry level				
θ^z	Industry z's rs intensity	19	0.442	0.138	0.183	0.7
		4. Country-industry level				
$\theta^z lnA_i$	$\theta^z \times lnA_i$	416	-0.168	0.071	-0.464	-0.031
$\theta^z lnD_i$	$\theta^z \times lnD_i$	416	-0.159	0.070	-0.445	-0.033
		5. Exporter-importer-industry level				
$ln(M_{ij}/M_{ii})^z$	Ln relative global osurcing	8,532	-6.855	3.052	-22.370	14.260

Notes: In the estimation, error terms are clustered at the country-industry level.

The regression presented in equation (22) is based on 19 input industries and 22 source and destination countries. With missing values, a total of 8,532 observations are employed for the analysis. In this dataset, five types of data exist according to data level: country level (i or j level), importer-exporter-level (j-i level), industry level (z level), country-industry level

production, the rankings of rs intensities remain very similar. The correlation between the rs intensity measures in Table 4 and the rs intensity measures obtained only using the US input share is 0.94.

(i-z or j-z level), and exporter-importer-industry level (i-j-z level). To address potentially correlated error terms at the country-industry level, error terms are clustered at the i-z level. Note that when error terms are clustered at the j-z level, the estimates in the following section show a higher overall significance level than when they are clustered at the i-z level, implying that error terms are more correlated at the i-z level than the j-z level. Variable definition and descriptive statistics for each type of data are shown in Table 5.

7.1 Estimation

Table 6 shows the OLS results of the estimation equation (22). Column (1) only includes the individual terms without controlling other types of institutions. The estimates for the main variables from θ^z to lnD_j are statistically significant and consistent with expectations. When controlling for formal and informal institutions in column (2), the magnitude of the estimated coefficients on the quality of commercial arbitration regimes falls as expected, but they are still statistically significant. The effects of the main variables and the statistical significance remain similar when the rule of law index is used instead of formal institutions in column (3).

I include all interaction terms in columns (4) and (5). Concerning the interaction terms, they are all insignificant except $\theta^z lnA_j$. However, the signs of the insignificant interactions terms, $\theta^z lnA_i$ and $\theta^z lnA_j$, are consistent with the predicted directions of their effects on relative global sourcing through a firm's entry decision, as presented in Table 1.

The individual effects can also be quantified using the estimates in column (4) by holding other variables fixed at their mean values. For instance, the association of θ^z and relative global sourcing is -2.836 $(= 3.829+(2.968+4.867)\times(-0.381)+(10.798-0.547)\times(-0.359))$. The signs of the effects of other variables, which are obtained using the same method, are consistent with expectations, and the magnitudes of the effects are close to their corresponding magnitudes in column (2). These results support the theoretical results that relative global sourcing rises with the quality of international arbitration regimes, while falling with

Table 6: OLS estimates

Variable	Dependent variable is $ln(M_{ij}/M_{ii})^z$ (1)	(2)	(3)	(4)	(5)
θ^z	-2.809**	-2.821**	-2.819**	3.829*	3.836*
	(1.269)	(1.256)	(1.248)	(2.079)	(2.079)
lnA_i	29.839***	26.497***	26.595***	25.214***	25.331***
	(4.711)	(3.302)	(3.435)	(4.633)	(4.669)
lnA_j	36.807***	32.290***	32.352***	30.103***	30.153***
	(3.536)	(2.196)	(2.182)	(2.504)	(2.488)
lnD_i	-23.600***	-19.831***	-20.007***	-24.634***	-24.839***
	(5.292)	(3.503)	(3.603)	(4.674)	(4.668)
lnD_j	-29.371***	-24.646***	-24.351***	-24.373***	-24.063***
	(3.868)	(2.383)	(2.332)	(2.612)	(2.566)
$\theta^z lnA_i$				2.968	2.936
				(10.198)	(10.211)
$\theta^z lnA_j$				4.867*	4.882*
				(2.706)	(2.707)
$\theta^z lnD_i$				10.798	10.849
				(10.489)	(10.499)
$\theta^z lnD_j$				-0.547	-0.565
				(2.490)	(2.491)
$ln(W_j/W_i)$	-0.017	-0.000	-0.000	-0.000	-0.000
	(0.064)	(0.064)	(0.067)	(0.064)	(0.066)
$lnPOP_i$	-5.709***	-8.948***	-7.869***	-8.947***	-7.868***
	(2.183)	(3.180)	(3.035)	(3.148)	(3.004)
$lnPOP_j$	-6.183***	-9.532***	-8.626***	-9.526***	-8.622***
	(2.077)	(3.067)	(2.942)	(3.040)	(2.917)
RD_i	0.464***	0.157	0.098	0.156	0.097
	(0.171)	(0.270)	(0.265)	(0.274)	(0.269)
RD_j	0.649***	0.351	0.311	0.350	0.311
	(0.152)	(0.259)	(0.252)	(0.262)	(0.256)
$lnGDP_i$	4.582**	8.163**	7.119**	8.164**	7.120**
	(2.004)	(3.193)	(3.083)	(3.160)	(3.051)
$lnGDP_j$	6.199***	9.821***	8.980***	9.815***	8.976***
	(1.866)	(3.050)	(2.952)	(3.025)	(2.929)
$LLOCKED_i$	-3.914***	-2.750***	-2.692***	-2.748***	-2.690***
	(0.847)	(0.633)	(0.544)	(0.635)	(0.546)
$LLOCKED_j$	-4.595***	-3.434***	-3.210***	-3.432***	-3.207***
	(0.891)	(0.623)	(0.530)	(0.622)	(0.528)
$lnFD_i$	-2.809***	-5.625***	-5.334***	-5.624***	-5.334***
	(0.790)	(1.662)	(1.536)	(1.646)	(1.520)
$lnFD_j$	-3.647***	-6.393***	-5.914***	-6.387***	-5.908***
	(0.780)	(1.673)	(1.521)	(1.657)	(1.505)
$lnHC_i$	-7.859***	-13.435***	-12.821***	-13.453***	-12.836***
	(2.018)	(4.439)	(4.463)	(4.397)	(4.426)
$lnHC_j$	-5.780***	-11.717***	-11.533***	-11.708***	-11.526***
	(1.507)	(4.079)	(4.178)	(4.055)	(4.153)
$lnFOR_i$		1.824		1.823	
		(1.420)		(1.403)	
$lnFOR_j$		0.874		0.872	
		(1.318)		(1.316)	
$lnINF_i$		11.824**	10.726**	11.831**	10.735**
		(4.702)	(4.568)	(4.710)	(4.574)
$lnINF_j$		11.251**	10.498**	11.240**	10.486**
		(4.897)	(4.670)	(4.890)	(4.666)
$lnROL_i$			1.533		1.537
			(1.108)		(1.090)
$lnROL_j$			0.427		0.421
			(0.958)		(0.959)
Country pair FE	Y	Y	Y	Y	Y
Input-industry FE	Y	Y	Y	Y	Y
No. of countries	22	22	22	22	22
No. of input-industries	19	19	19	19	19
No. of clusters	416	416	416	416	416
Observations	8,532	8,532	8,532	8,532	8,532
R-squared	0.614	0.615	0.615	0.619	0.619

Notes: Error terms are clustered at the *i-z* level. Robust standard errors are in parentheses. ***, **, and * represent the estimates that are significant at the levels of 1%, 5%, and 10%, respectively. Estimates for a constant are not reported.

the quality of domestic arbitration regimes. These results also support the theoretical prediction of a firm's avoidance of global sourcing as the rs intensity of input industry rises.

It is interesting that the estimates on financial development and human capital are negative and statistically significant in every column. That is, as a source country and destination country have a better financial system and more skilled labor, global sourcing relative to the source country's domestic sourcing tends to decrease. The estimation results might imply that firms are more attracted to domestic sourcing than global sourcing, as an economy saves extra costs by using a high-quality financial system and human capital. This might be because financial development and human capital are not directly related to reducing opportunism. Without institutions mitigating opportunism, a higher risk of opportunism in transacting with foreign parties rather than local parties can hinder costs for global sourcing from falling. Thus, as an economy saves extra costs through financial development and human capital, costs for domestic sourcing can become cheaper relative to global sourcing, attracting more domestic sourcing.

Concerning formal and informal institutions and the rule of law index, the signs on their estimated coefficients are all positive, but the estimated coefficients on them are not statistically significant. Setting aside the statistical significance matter, these positive signs of the estimates imply that foreign transactions require a higher quality of formal and informal institutions and parties' greater confidence in rule of law than domestic transactions. These institutions are more directly related to mitigating opportunism than human capital and financial development. Since foreign transaction involves a higher risk than domestic transactions due to cultural and geographical distance, the role of institutions, which mitigate opportunism in both domestic and foreign transactions, can become more important in foreign transactions.

Even though these results, overall, are as expected, the magnitudes and statistical significance might be affected by the bias arising from the omitted variable of how much relative global sourcing occurred in the past. For instance, if the value of relative global sourcing

in the past is high, policy makers of a country would develop the quality of international arbitration regimes to support and foster foreign transactions. Conversely, if the past performance of relative global sourcing is poor, the policy makers might enhance the quality of domestic arbitration regime to protect local traders.

Controlling the past level of relative global sourcing considerably addresses the potential reverse causality. The current performance of relative global sourcing could influence the current level of the quality of domestic and international arbitration regimes based on the past performance of relative global sourcing. It would be unlikely for the policy makers to develop the quality of arbitration regimes based on only the current performance due to the high cost of constructing better arbitration regimes. Accordingly, the reverse causality effect is expected to be close to the effect of the past performance of relative global sourcing on the current quality of arbitration regimes. Thus, including the past performance of global sourcing as a control variable helps estimate true effects of the quality of arbitration regimes by disentangling the effect of the past performance of global sourcing on the quality, which is expected to be close to the reverse causality effect. That is, by utilizing variation in global sourcing that is not related to the past level of global sourcing, the main channel through which the reverse causation could run is controlled.

Institutions, in which arbitration regimes are included, feature path-dependence and increasing returns, which makes institutions stable over time. According to North (1990, pp. 92-104), the Northwest Ordinance, passed in 1787, epitomizes this feature of institutions. The ordinance provided for the fundamental structure of inheritance and fee-simple ownership of the vast land area in the West, while trying to create new states by integrating the area. In fact, the basic structure of the provisions, including the fee-simple land ownership, in the ordinance originated from the rules of the colonies of Great Britain. After the ordinance was constructed, it governed basic land ownership, while the US expanded its territories over the next century. In addition, based on the ordinance, the framework of property rights and political rules in the new territories was determined. This, in turn, promoted the emergence

of the entrepreneurs who were trying to take advantage of the new institutions politically and economically, which made land policies more efficient.

This example indeed evidences that arbitration regimes, as a specific type of legal institution, do not easily respond to the current economic situation due to the characteristics of path-dependence and increasing returns, which results from a high set-up cost. That is, arbitration regimes are more likely to be developed when the volume of global sourcing in the past is high enough to offset the frictions from path-dependence and the high set-up cost. Hence, this example supports the use of the past level of global sourcing as a control variable to address the potential reverse causality.

Even though this strategy might not fully address the reverse causality, I do not employ the instrumental variables (IV) estimation. It is doubtful that it is possible to find proper instrumental variables for the qualities of domestic and international arbitration regimes. As explained in Section 6.2, some regimes apply to a general commercial arbitration that encompasses both domestic and international arbitrations, while other regimes solely apply domestic or international arbitration. Additionally, the regimes on domestic arbitral awards support enforcing the awards made in international arbitration, as well as the awards made in domestic arbitration. This stems from the fact that the distinction between domestic and foreign arbitral awards is based on geographical distance between places in which an award is made and sought, while the distinction between domestic and international arbitration rests not only on this geographical distance but also on the existence of more than one country that is related to the subject matter of arbitration.[31] Finding an exogenous variable that captures this nature of arbitration regimes and affects relative global sourcing only through arbitration regimes seems unrealistic. Therefore, I rely on controlling the past performance of relative global sourcing to address the reverse causality.

Table 7 shows the estimates obtained by including the average of $\left(\frac{M_{ij}}{M_{ii}}\right)^{z}$ over the years of 1995, 1999, 2003 and 2007 as an independent variable. As can be seen in this table, the

[31] See the Introduction to find the definition of foreign arbitral awards and Article 1 (3) of the Model law that makes the distinction between domestic and international arbitration.

Table 7: OLS estimates with the control of reverse causality

Variable	Dependent variable is $ln(M_{ij}/M_{ii})^z$ (1)	(2)	(3)	(4)	(5)
$ln(avg.past\,(Mij/Mii)^z)$	0.488***	0.493***	0.492***	0.489***	0.488***
	(0.169)	(0.169)	(0.168)	(0.169)	(0.168)
θ^z	-1.882**	-1.911**	-1.908**	1.603	1.620
	(0.874)	(0.853)	(0.849)	(1.644)	(1.647)
lnA_i	14.938**	15.526***	15.676***	15.512***	15.682***
	(6.601)	(4.800)	(4.860)	(4.295)	(4.343)
lnA_j	16.818**	15.432***	15.678***	15.626***	15.852***
	(7.102)	(5.648)	(5.500)	(5.104)	(4.971)
lnD_i	-10.486*	-12.391***	-12.498***	-16.317***	-16.460***
	(6.259)	(3.771)	(3.829)	(4.057)	(4.077)
lnD_j	-12.430*	-12.911***	-12.575***	-13.444***	-13.091***
	(6.495)	(4.337)	(4.292)	(4.258)	(4.221)
$\theta^z lnA_i$				0.287	0.253
				(7.376)	(7.438)
$\theta^z lnA_j$				-0.184	-0.148
				(2.534)	(2.525)
$\theta^z lnD_i$				8.678	8.746
				(7.305)	(7.367)
$\theta^z lnD_j$				1.032	1.002
				(2.150)	(2.154)
$ln(W_j/W_i)$	0.039	0.072	0.070	0.071	0.069
	(0.046)	(0.046)	(0.048)	(0.046)	(0.048)
$lnPOP_i$	-6.058***	-5.783**	-3.545	-5.807**	-3.576
	(1.811)	(2.858)	(2.881)	(2.836)	(2.859)
$lnPOP_j$	-5.778***	-5.794**	-3.752	-5.819**	-3.785
	(1.730)	(2.828)	(2.871)	(2.809)	(2.853)
RD_i	0.041	0.188	0.071	0.188	0.070
	(0.197)	(0.212)	(0.214)	(0.213)	(0.216)
RD_j	0.144	0.218	0.121	0.218	0.122
	(0.202)	(0.200)	(0.199)	(0.201)	(0.201)
$lnGDP_i$	5.259***	5.341*	3.192	5.364*	3.220
	(1.679)	(2.824)	(2.850)	(2.801)	(2.828)
$lnGDP_j$	5.549***	5.824**	3.914	5.851**	3.948
	(1.569)	(2.855)	(2.911)	(2.836)	(2.894)
$LLOCKED_i$	-2.818***	-2.035***	-1.824***	-2.041***	-1.832***
	(0.787)	(0.530)	(0.487)	(0.532)	(0.490)
$LLOCKED_j$	-3.186***	-2.486***	-2.082***	-2.494***	-2.091***
	(0.879)	(0.599)	(0.592)	(0.598)	(0.590)
$lnFD_i$	-2.533***	-3.847**	-3.119**	-3.861**	-3.138**
	(0.653)	(1.507)	(1.451)	(1.497)	(1.440)
$lnFD_j$	-2.955***	-4.276***	-3.340**	-4.291***	-3.356**
	(0.681)	(1.597)	(1.565)	(1.587)	(1.554)
$lnHC_i$	-5.462***	-5.809	-4.733	-5.874	-4.799
	(1.800)	(4.202)	(4.292)	(4.177)	(4.270)
$lnHC_j$	-3.585**	-5.241	-4.642	-5.275	-4.681
	(1.567)	(4.159)	(4.261)	(4.137)	(4.240)
$lnFOR_i$		3.538***		3.527***	
		(1.322)		(1.315)	
$lnFOR_j$		2.305**		2.297**	
		(1.127)		(1.130)	
$lnINF_i$		6.325	4.082	6.376	4.142
		(4.200)	(4.201)	(4.194)	(4.193)
$lnINF_j$		6.988	5.247	7.016	5.279
		(4.555)	(4.479)	(4.537)	(4.462)
$lnROL_i$			2.768***		2.764***
			(0.994)		(0.986)
$lnROL_j$			1.465*		1.454*
			(0.818)		(0.822)
Country pair FE	Y	Y	Y	Y	Y
Input-industry FE	Y	Y	Y	Y	Y
No. of countries	22	22	22	22	22
No. of input-industries	19	19	19	19	19
No. of clusters	416	416	416	416	416
Observations	8,518	8,518	8,518	8,518	8,518
R-squared	0.730	0.733	0.732	0.735	0.734

Notes: Error terms are clustered at the *i-z* level. Robust standard errors are in parentheses. ***, **, and * represent the estimates that are significant at the levels of 1%, 5%, and 10%, respectively. Estimates for a constant are not reported.

magnitudes of the estimates on the main variables from θ^z to $\theta^z lnD_j$ tend to be substantially decreased compared to the corresponding estimates in Table 6. Without the 4 interaction terms, the estimated coefficients on the individual variables from θ^z to lnD_j through columns (1)–(3) are statistically significant. However, with the interaction terms in columns (4) and (5), the estimated coefficient on θ^z loses statistical significance, while the effects of A_i, A_j, D_i, and D_j are still significant.

To quantify the individual effects of rs intensity and the quality of arbitration regimes, the estimates in columns (2) and (3), in which other types of institutions are controlled, are used. Beginning with θ^z, a 1 percent increase in the rs intensity in input z leads to a 1.91 percent fall in j's global sourcing of z from i relative to i's domestic sourcing.[32] Additionally, a 1 percent rise in the quality of international arbitration regimes of i and j raises the relative global sourcing by 15.53–15.68 percent and 15.43–15.68 percent, respectively. In contrast, a 1 percent increase in the quality of domestic arbitration regimes of i and j reduces relative global sourcing by 12.39–12.50 percent and 12.58–12.91 percent, respectively.[33]

These effects remain similar when quantifying the estimates in column (4), while holding other variables fixed at their mean values. For example, the magnitude of the effect on A_i on relative global sourcing is 15.639 (=15.512+0.287×0.442), which is very similar to the corresponding value of 15.526 in column (2). Using the same method, the effects of other variables, A_j, D_i, D_j, and θ^z, on relative global sourcing are 15.545, -12.481, -12.988, and -1.922, respectively, which are close to the corresponding values in column (2).

In addition, the magnitude of the estimated coefficients on human capital and informal

[32]Notice that rs intensity is a share measuring the degree of rs transactions for production. Thus, to quantify its effect as an elasticity, the estimated coefficient on rs intensity does not need to be multiplied by 100.

[33]To get a sense of the effects of A_i in a nominal value, an ad-hoc method can be used by employing the median of $\left(\frac{M_{ij}}{M_{ii}}\right)^z$, 0.00134. The values of $\left(\frac{M_{ij}}{M_{ii}}\right)^z$ after the increase in A_i by 15.53–15.68 percent are about 0.00155. Since M_{ii}^z and M_{ij}^z are 4155.869 and 5.5728 millions of dollars when $\left(\frac{M_{ij}}{M_{ii}}\right)^z$ is 0.00134, fix M_{ii}^z at 4155.869 to see how much M_{ij} changes. Then, M_{ij}^z that corresponds to 0.00155 of $\left(\frac{M_{ij}}{M_{ii}}\right)^z$ is 6.4416. Thus, at the median of the relative global sourcing, M_{ij} increases by 0.869 (=6.4416-5.5728) millions of US dollars with a 1 percent increase in A_i, holding M_{ii} fixed.

institutions falls, compared to the corresponding estimates in Table 6, and the estimates tend to lose statistical significance. However, the effects of formal institutions and the rule of law increase and become significant. Concerning other control variables, the magnitudes of their impacts tend to decrease, and the directions of these impacts stay the same.

7.2 Robustness Check

As a robustness check, I examine how the estimates change when the legal system itself is more heavily weighted when constructing the measures for A and D. Specifically, instead of equal weighting, I use a 0.4:0.4:0.2 weighting for the categories of enforcement frame, enforcement regime itself, and the efficiency of enforcement, respectively, in the survey questions. That is, after calculating the three averages of the scores for the three categories, I obtain country-specific A and D by averaging them with the 0.4:0.4:0.2 weighting scheme. By doing so, how efficiently the regimes act is less weighted in capturing the quality of arbitration regimes.

Table 8 shows the OLS estimates that are obtained using this measure. As can be seen, compared to the estimates in Table 7, the magnitudes of the estimated coefficients on A_i, A_j, D_i, and D_j tend to remain similar, while being statistically significant. Even when using a 0.45:0.45:0.1 weighting scheme, their estimates remain similar and statistically significant, even though I do not report the result. Other control variables tend to be not far away from the estimates with the original measures for A and D.

As another robustness check, I use the 2005 WIOD instead of the 2010 WIOD to calculate the input and output shares, expressed as $\alpha_{si}^{pz'}$ and $\xi_i^{z'}$ in equation (23), in the process of measuring θ^z. I still use Rauch's 2007 classification to get r_p. As can be seen in Table 9, the signs and the statistical significance of the estimated coefficients on the main variables from θ^z to $\theta^z lnD_j$ stay the same, compared to the signs of these in Table 7. Their magnitudes also remain similar.

Lastly, I examine whether the multicollinearity between A and D causes a serious issue in

Table 8: Robustness check with a 0.4:0.4:0.2 weighting scheme

Variable	Dependent variable is $ln(M_{ij}/M_{ii})^z$ (1)	(2)	(3)	(4)	(5)
$ln(avg.past(Mij/Mii)^z)$	0.487***	0.493***	0.492***	0.489***	0.488***
	(0.169)	(0.170)	(0.168)	(0.170)	(0.168)
θ^z	-1.886**	-1.912**	-1.908**	1.356	1.376
	(0.872)	(0.853)	(0.849)	(1.634)	(1.636)
lnA_i	14.880**	14.826***	15.003***	14.828***	15.021***
	(6.123)	(4.525)	(4.629)	(3.909)	(3.990)
lnA_j	17.295**	14.889***	15.316***	15.164***	15.571***
	(6.827)	(5.612)	(5.454)	(5.091)	(4.946)
lnD_i	-10.236*	-12.113***	-12.127***	-15.966***	-16.012***
	(5.660)	(3.632)	(3.683)	(3.798)	(3.808)
lnD_j	-12.678**	-12.799***	-12.497***	-13.247***	-12.927***
	(6.084)	(4.369)	(4.292)	(4.250)	(4.182)
$\theta^z lnA_i$				0.220	0.199
				(6.669)	(6.717)
$\theta^z lnA_j$				-0.400	-0.367
				(2.313)	(2.304)
$\theta^z lnD_i$				8.537	8.596
				(6.668)	(6.718)
$\theta^z lnD_j$				0.859	0.833
				(1.992)	(1.995)
$ln(W_j/W_i)$	0.032	0.068	0.067	0.068	0.066
	(0.045)	(0.044)	(0.047)	(0.044)	(0.047)
$lnPOP_i$	-7.567***	-6.998**	-4.019	-7.031**	-4.052
	(1.985)	(3.118)	(3.009)	(3.098)	(2.991)
$lnPOP_j$	-7.333***	-7.002**	-4.227	-7.036**	-4.264
	(1.945)	(3.132)	(3.021)	(3.115)	(3.005)
RD_i	-0.311**	-0.069	-0.247	-0.071	-0.249
	(0.144)	(0.231)	(0.230)	(0.233)	(0.232)
RD_j	-0.212	-0.030	-0.194	-0.032	-0.195
	(0.135)	(0.231)	(0.227)	(0.231)	(0.228)
$lnGDP_i$	6.671***	6.618**	3.771	6.650**	3.803
	(1.819)	(3.080)	(2.992)	(3.059)	(2.973)
$lnGDP_j$	7.015***	7.092**	4.500	7.128**	4.538
	(1.800)	(3.195)	(3.097)	(3.178)	(3.081)
$LLOCKED_i$	-3.447***	-2.132***	-1.809***	-2.139***	-1.816***
	(0.880)	(0.540)	(0.479)	(0.543)	(0.482)
$LLOCKED_j$	-3.822***	-2.589***	-2.076***	-2.597***	-2.084***
	(0.981)	(0.620)	(0.589)	(0.620)	(0.588)
$lnFD_i$	-2.688***	-4.520***	-3.514**	-4.539***	-3.534**
	(0.669)	(1.630)	(1.530)	(1.622)	(1.521)
$lnFD_j$	-3.129***	-4.941***	-3.753**	-4.961***	-3.772**
	(0.713)	(1.765)	(1.677)	(1.755)	(1.667)
$lnHC_i$	-6.163***	-6.977	-5.712	-7.050	-5.782
	(2.009)	(4.572)	(4.587)	(4.550)	(4.568)
$lnHC_j$	-4.356**	-6.404	-5.602	-6.447	-5.649
	(1.813)	(4.565)	(4.576)	(4.545)	(4.556)
$lnFOR_i$		4.690***		4.688***	
		(1.206)		(1.199)	
$lnFOR_j$		3.459***		3.459***	
		(1.108)		(1.111)	
$lnINF_i$		9.044*	6.258	9.113*	6.330
		(4.730)	(4.674)	(4.726)	(4.670)
$lnINF_j$		9.644*	7.410	9.694*	7.458
		(5.225)	(5.019)	(5.208)	(5.003)
$lnROL_i$			3.612***		3.615***
			(0.932)		(0.923)
$lnROL_j$			2.352***		2.347***
			(0.804)		(0.808)
Country pair FE	Y	Y	Y	Y	Y
Input-industry FE	Y	Y	Y	Y	Y
No. of countries	22	22	22	22	22
No. of input-industries	19	19	19	19	19
No. of clusters	416	416	416	416	416
Observations	8,518	8,518	8,518	8,518	8,518
R-squared	0.731	0.733	0.732	0.735	0.734

Notes: Error terms are clustered at the *i-z* level. Robust standard errors are in parentheses. ***, **, and * represent the estimates that are significant at the levels of 1%, 5%, and 10%, respectively. Estimates for a constant are not reported.

Table 9: Robustness check with θ^z obtained using the 2005 WIOD

Variable	Dependent variable is $ln(M_{ij}/M_{ii})^z$ (1)	(2)	(3)	(4)	(5)
$ln(avg.past\,(Mij/Mii)^z)$	0.488***	0.493***	0.492***	0.490***	0.489***
	(0.169)	(0.169)	(0.168)	(0.169)	(0.168)
θ^z	-1.974**	-2.006**	-2.002**	1.340	1.358
	(0.917)	(0.895)	(0.891)	(1.645)	(1.649)
lnA_i	14.938**	15.526***	15.676***	15.385***	15.550***
	(6.601)	(4.800)	(4.860)	(4.316)	(4.373)
lnA_j	16.818**	15.432***	15.678***	15.655***	15.881***
	(7.102)	(5.648)	(5.500)	(5.116)	(4.982)
lnD_i	-10.486*	-12.391***	-12.498***	-16.012***	-16.149***
	(6.259)	(3.771)	(3.829)	(4.042)	(4.074)
lnD_j	-12.430*	-12.911***	-12.575***	-13.368***	-13.014***
	(6.495)	(4.337)	(4.292)	(4.255)	(4.216)
$\theta^z lnA_i$				0.559	0.536
				(7.164)	(7.231)
$\theta^z lnA_j$				-0.292	-0.256
				(2.592)	(2.584)
$\theta^z lnD_i$				8.168	8.226
				(6.851)	(6.923)
$\theta^z lnD_j$				0.902	0.872
				(2.189)	(2.192)
$ln(W_j/W_i)$	0.039	0.072	0.070	0.072	0.070
	(0.046)	(0.046)	(0.048)	(0.046)	(0.048)
$lnPOP_i$	-6.058***	-5.783**	-3.545	-5.804**	-3.572
	(1.811)	(2.858)	(2.881)	(2.841)	(2.864)
$lnPOP_j$	-5.778***	-5.794**	-3.752	-5.815**	-3.780
	(1.730)	(2.828)	(2.871)	(2.814)	(2.857)
RD_i	0.041	0.188	0.071	0.188	0.070
	(0.197)	(0.212)	(0.214)	(0.213)	(0.216)
RD_j	0.144	0.218	0.121	0.218	0.122
	(0.202)	(0.200)	(0.199)	(0.201)	(0.201)
$lnGDP_i$	5.259***	5.341*	3.192	5.361*	3.216
	(1.679)	(2.824)	(2.850)	(2.807)	(2.833)
$lnGDP_j$	5.549***	5.824**	3.914	5.847**	3.943
	(1.569)	(2.855)	(2.911)	(2.841)	(2.898)
$LLOCKED_i$	-2.818***	-2.035***	-1.824***	-2.041***	-1.832***
	(0.787)	(0.530)	(0.487)	(0.532)	(0.490)
$LLOCKED_j$	-3.186***	-2.486***	-2.082***	-2.493***	-2.090***
	(0.879)	(0.599)	(0.592)	(0.598)	(0.590)
$lnFD_i$	-2.533***	-3.847**	-3.119**	-3.860**	-3.136**
	(0.653)	(1.507)	(1.451)	(1.499)	(1.443)
$lnFD_j$	-2.955***	-4.276***	-3.340**	-4.289***	-3.354**
	(0.681)	(1.597)	(1.565)	(1.589)	(1.557)
$lnHC_i$	-5.462***	-5.809	-4.733	-5.866	-4.790
	(1.800)	(4.202)	(4.292)	(4.184)	(4.276)
$lnHC_j$	-3.585**	-5.241	-4.642	-5.268	-4.673
	(1.567)	(4.159)	(4.261)	(4.142)	(4.245)
$lnFOR_i$		3.538***		3.530***	
		(1.322)		(1.317)	
$lnFOR_j$		2.305**		2.298**	
		(1.127)		(1.130)	
$lnINF_i$		6.325	4.082	6.371	4.135
		(4.200)	(4.201)	(4.199)	(4.199)
$lnINF_j$		6.988	5.247	7.011	5.273
		(4.555)	(4.479)	(4.543)	(4.467)
$lnROL_i$			2.768***		2.766***
			(0.994)		(0.987)
$lnROL_j$			1.465*		1.456*
			(0.818)		(0.822)
Country pair FE	Y	Y	Y	Y	Y
Input-industry FE	Y	Y	Y	Y	Y
No. of countries	22	22	22	22	22
No. of input-industries	19	19	19	19	19
No. of clusters	416	416	416	416	416
Observations	8,518	8,518	8,518	8,518	8,518
R-squared	0.730	0.733	0.732	0.734	0.734

Notes: Robust standard errors are in parentheses. ***, **, and * represent the estimates that are significant at the levels of 1%, 5%, and 10%, respectively. Estimates for a constant are not reported.

Table 10: Robustness check by subsample

	Dependent variable is $ln(M_{ij}/M_{ii})^z$				
	(1)	(2)	(3)	(4)	(5)
Variable	Full sample	First half of random sample	Second half of random sample	First half of different random sample	Second half of different random sample
θ^z	-1.911**	-1.578*	-2.356**	-2.056**	-1.494*
	(0.853)	(0.934)	(0.950)	(1.005)	(0.883)
lnA_i	15.526***	15.268***	16.043***	14.715***	15.167**
	(4.800)	(5.820)	(4.372)	(4.457)	(6.221)
lnA_j	15.432***	15.990**	14.803***	14.501***	15.434**
	(5.648)	(6.438)	(5.213)	(5.232)	(6.884)
lnD_i	-12.391***	-11.548**	-13.390***	-11.851***	-11.648**
	(3.771)	(5.057)	(3.630)	(3.822)	(5.594)
lnD_j	-12.911***	-13.220**	-12.539***	-12.109***	-12.782**
	(4.337)	(5.172)	(4.414)	(4.409)	(5.804)
Country pair FE	Y	Y	Y	Y	Y
Input-industry FE	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y
No. of clusters	416	416	416	416	416
Observations	8,518	4,259	4,259	4,259	4,259
R-squared	0.733	0.725	0.759	0.748	0.735

Notes: No interaction terms are included in the regressions. Other estimates are not reported. The estimates in column (2) come from Table 7. The estimates in columns (2)-(3) are obtained using the two sub-samples from a uniform distribution on (0,1). The estimates in columns (4)-(5) are obtained using the different two sub-samples from a newly drawn uniform distribution. Robust standard errors are in parentheses. ***, **, and * represent the estimates that are significant at the level of 1%, 5%, and 10%, respectively.

the estimation. With the 22 countries, their correlation is 0.92. This stems from the fact that some regimes enforce both domestic and international arbitrations. One of the methodologies that check if multicollinearity causes a serious issue, which increases the standard errors, is to examine how sensitively estimates change between sub-samples. When the estimates are considerably different between the sub-samples, multicollinearity can be a serious issue. Adopting this methodology, I analyze the sensitivity of the estimates using the two different random sub-samples from a uniform distribution on (0,1).

Specifically, the estimates in columns (2) and (3) in Table 10 are obtained with the two sub-samples from a uniform distribution. The estimates in columns (4) and (5) are obtained with the different two sub-samples from a newly drawn uniform distribution. As can be seen in Table 10, compared to the estimates from the full sample in column (1), the estimates tend to be stable across different samples, which implies that the multicollinearity does not cause a serious concern for the estimation.

8 Concluding Remarks

This paper identifies that differences in the qualities of domestic and international commercial arbitration regimes between countries are an important determinant of global sourcing patterns. The theoretical and empirical results show that relative global sourcing increases with each country's quality of international commercial arbitration regimes, while falling with each country's quality of domestic commercial arbitration regimes.

This paper also identifies that differences in the degree to which relationship-specific transactions are required for production between industries are another important determinant of global sourcing patterns. The theoretical and empirical results show that a rise in an input industry's rs intensity decreases relative global sourcing, capturing a firm's avoidance of global sourcing exposed to a higher level of opportunism than domestic sourcing.

The results of this paper fundamentally evidence that a firm's avoidance of opportunism is one of the important determinants of global sourcing patterns. Opportunism arises in the presence of relationship-specific transactions and is reduced by high-quality national commercial arbitration regimes, which creates the significance of the quality of arbitration regimes in determining sourcing patterns. Future promising research regarding relationship-specificity should include exploring a firm's use of litigation and/or arbitration as a dispute resolution mechanism in international trade.

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Appendix A Pervasive Domestic Sourcing

In this Appendix A, I examine the case where the FGPs in country j and i choose domestic sourcing, which is represented by region C in Figure 1. As can be seen in this figure, this case is more likely to occur when the level of A_i is low.

Without loss of generality, let us consider country j's general equilibrium. Labor market clearing condition imposes that $y_j^D(\omega)n_j + x_{jj}(\omega)n_j + f_j n_j = L_j$. Since $x_{jj}(\omega) = y_j^D(\omega) = y_{ji}^D(\omega) + y_{jj}^D(\omega)$, this condition is expressed as

$$2^{1-\sigma}(\lambda_i + \lambda_j)(\theta D_j + 1 - \theta)^\sigma \left(\frac{\sigma - 1}{\sigma}\right)^\sigma w_j^{-\sigma} n_j + f_j n_j = L_j. \tag{A.1}$$

The zero profit condition requires the operating profits expressed in equation (11) to equal the fixed cost. The ratio of this condition for country j to country i gives the following equilibrium wage ratio:

$$\frac{w_j}{w_i} = \frac{1 - \theta + \theta D_j}{1 - \theta + \theta D_i} \left(\frac{f_i}{f_j}\right)^{\frac{1}{\sigma}}. \tag{A.2}$$

Since the firms in both countries engage in domestic sourcing, only the quality of domestic commercial arbitration regimes determine the wage ratio.

It is straightforward to show that $\frac{\partial\left(\frac{w_j}{w_i}\right)}{\partial D_j} > 0$, and $\frac{\partial\left(\frac{w_j}{w_i}\right)}{\partial D_i} < 0$. Additionally, $\frac{\partial\left(\frac{w_j}{w_i}\right)}{\partial \theta}$ is negative if $D_i > D_j$ and positive if $D_i < D_j$. Regarding joint effects, $\frac{\partial^2\left(\frac{w_j}{w_i}\right)}{\partial D_j \partial \theta} > 0$, and $\frac{\partial^2\left(\frac{w_j}{w_i}\right)}{\partial D_i \partial \theta} < 0$. These contrast with the ambiguous differential effects of the quality of arbitration regimes across rs intensity when a country's FGP chooses global sourcing.

Combining the wage ratio with the zero profit condition pins down n_j as follows:

$$n_j = \frac{L_j}{f_j \sigma}. \tag{A.3}$$

Again, in comparison to the equilibrium n_j that depends on $\frac{w_j}{w_i}$ when global sourcing exists, which is expressed in equation (19), this n_j is independent of $\frac{w_j}{w_i}$. This is because the effect of a change in revenue on n_j is fully offset through the wage ratio in the process of free

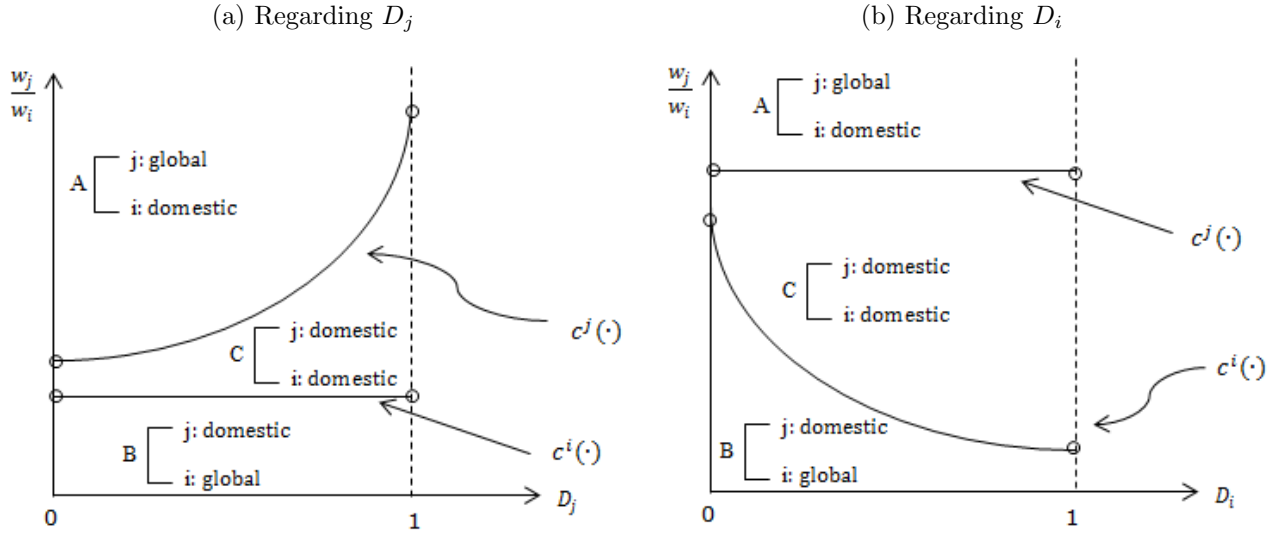
entry and labor market clearing. In contrast, when a change in revenue occurs in the case of global sourcing, the wage ratio is not fully adjusted. Specifically, the operating profits and the number of labor used for sales are a function of $(w_i + w_j)$ due to the use of labor in i, while the fixed cost in value is expressed as $f_j w_j$; this asymmetric wage structure causes the wage ratio not to be fully adjusted when the revenue changes, leading to the lingering effect of altering n_j.

The ratios of the total trade flows for the intermediate input and final good and the ratios of the total sales and welfare are calculated using the same methodologies described in Section 4.1.2. Then, $\frac{M_{jj}}{M_{ii}}$, $\frac{Y_{ij}}{Y_{ii}}$, $\frac{Y_j}{Y_i}$, and $\frac{U_j}{U_i}$ are all simplified as $\frac{w_j}{w_i}\frac{L_j}{L_i}$. Thus, the effects of domestic arbitration regimes on these ratios are the same as their effects on $\frac{w_j}{w_i}$.

Thus, in the case where the FGPs in i and j choose domestic sourcing, $\frac{\partial\left(\frac{M_{jj}}{M_{ii}}\right)}{\partial D_j} > 0$, $\frac{\partial\left(\frac{Y_{ij}}{Y_{ii}}\right)}{\partial D_j} > 0$, $\frac{\partial\left(\frac{Y_j}{Y_i}\right)}{\partial D_j} > 0$, and $\frac{\partial\left(\frac{U_j}{U_i}\right)}{\partial D_j} > 0$. Additionally, $\frac{\partial^2\left(\frac{M_{jj}}{M_{ii}}\right)}{\partial D_j \partial\theta} > 0$, $\frac{\partial^2\left(\frac{Y_{ij}}{Y_{ii}}\right)}{\partial D_j \partial\theta} > 0$, $\frac{\partial^2\left(\frac{Y_j}{Y_i}\right)}{\partial D_j \partial\theta} > 0$, and $\frac{\partial^2\left(\frac{U_j}{U_i}\right)}{\partial D_j \partial\theta} > 0$. The direction of each individual response according to a rise in D_i and the direction of each differential effect of D_i across θ are the opposite. Lastly, $\frac{\partial\left(\frac{M_{jj}}{M_{ii}}\right)}{\partial\theta} > 0$, $\frac{\partial\left(\frac{Y_{ij}}{Y_{ii}}\right)}{\partial\theta} > 0$, $\frac{\partial\left(\frac{Y_j}{Y_i}\right)}{\partial\theta} > 0$, and $\frac{\partial\left(\frac{U_j}{U_i}\right)}{\partial\theta} > 0$ if $D_i < D_j$. The opposite responses exist if $D_i > D_j$.

Appendix B Choice of Sourcing Mode in Terms of Domestic Commercial Arbitration Regimes

Figure B.1: Choice of Sourcing Mode



In this Appendix, I discuss how the sourcing mode choice responds to changes in the quality of domestic commercial regimes.

Beginning with sub-figure (a) in Figure B.1, the cutoff function for j's FGP, $c^j(\cdot)$, is upward-sloping and convex on D_j, implying that for j's FGP to choose global sourcing, i's labor needs to be relatively cheaper as the cost of domestic sourcing falls with D_j. When the wage ratio, $\frac{w_j}{w_i}$, is above the cutoff function of $c^j(\cdot)$, represented by region A, the FGPs of j and i choose global and domestic sourcing, respectively. The cutoff function for i's FGP, $c^i(\cdot)$, is the horizontal line over D_j since D_j does not affect the choice of i's FGP between domestic and global sourcing. When the wage ratio is low enough so that it is below $c^i(\cdot)$, indicated by region B, j's FGP chooses domestic sourcing and i's FGP chooses global sourcing over the whole range of D_j. In region C between the two cutoff functions, all FGPs choose domestic sourcing. Note that the cutoff function of $c^j(\cdot)$ exists above $c^i(\cdot)$ at each level of D_j. If $c^i(\cdot)$ is above the minimum value of the wage ratio on the $c^j(\cdot)$ within a certain subset of D_j, there will be a region where both countries' FGPs choose global sourcing, contradicting

Proposition 1.

In region A, the equilibrium wage ratio in equation (18) does not rely on D_j since j's FGP chooses global sourcing. Thus, only partial equilibrium effects happen as D_j approaches $c^j(\cdot)$. That is, as D_j rises given a fixed level of the wage ratio, j's FGP is more likely to change her sourcing mode from global sourcing in region A to domestic sourcing in region C. Once j's FGP enters region C, the wage ratio increases with D_j, as shown in Appendix A. Therefore, as D_j rises in the neighborhood of $c^j(\cdot)$ in region C, it is possible for j's FGP to change her sourcing mode from domestic sourcing to global sourcing in region A. However, as D_j further rises, j's FGP can go back to domestic sourcing in region C through the partial equilibrium effect. This implies that the effect of D_j on the firms' choices in the neighborhood of $c^j(\cdot)$ is ambiguous. In the majority of areas in region C, the choices of firms are not flipped. In region B, the wage ratio rises with D_j according to the comparative statics result in Section 4.1.1, and hence the choice of i's FGP is more likely to change from global sourcing to domestic sourcing in region C, while j's FGP still chooses domestic sourcing. Taken together, as D_j rises, the firms tend to choose domestic sourcing through partial and general equilibrium effects.

Next, consider the choice of sourcing mode with respect to D_i. As shown in sub-figure (b) in Figure B.1, $c^i(\cdot)$ is downward-sloping and convex on D_i, implying that for i's FGP to choose global sourcing, the wage level of i relative to j should increase with D_i as the cost of domestic sourcing falls as D_i rises. When the wage ratio is below $c^i(\cdot)$, i's FGP chooses global sourcing, and j's FGP chooses domestic sourcing. The cutoff function for j's FGP, $c^j(\cdot)$, is horizontal over D_i because D_i does not come into play in the choice of sourcing mode by j's FGP. When the relative wage is high enough to be above the $c^j(\cdot)$ function, j's FGP chooses global sourcing, and i's FGP chooses domestic sourcing, regardless of what value D_i has. In region C, which is between two cutoff curves, domestic sourcing is pervasive. Note that if there is an area, in which $c^j(\cdot)$ is below $c^i(\cdot)$, both countries' FGPs will choose global sourcing in this area, contradicting Proposition 1.

In region A, the wage ratio decreases with D_i, so the choice of sourcing mode by j's FGP is more likely to change from global sourcing to domestic sourcing. In region B, the wage ratio is independent of D_i, causing only partial equilibrium effects to occur. That is, as D_i increases at the fixed level of the wage ratio in this region, the choice of i's FGP is more likely to be flipped from global sourcing to domestic sourcing. In region C, the increase in D_i leads the wage ratio to fall through the general equilibrium effects, and hence the FGP can switch to global sourcing in region B. However, through the partial equilibrium effects, i's FGP can return to domestic sourcing as D_i further increases. This process makes the firms' choices in the neighborhood of $c^i(\cdot)$ ambiguous. Therefore, as in the firms' choices with regard to D_j in sub-figure (a), domestic sourcing is more likely to be a dominant choice of the firms as D_i rises.

Appendix C AMD Survey Questions

Table C.1: Selected Questions

Question	DA or IA	Scoring
A. Enforcement Frame		
1. Does your national law recognize arbitration as a means of dispute resolution between private parties in commercial transactions?	DA/IA	Yes = 1, No or N/A = 0
2. Has your country enacted a specific statute on commercial arbitration?	DA/IA	Yes = 1, No or N/A = 0
3. Are the following types of disputes arbitrable under your countrys national law? (a) Disputes involving rights over immoveable property located within your country (b) Any intra-company disputes (c) Disputes involving shareholder arrangements (d) Disputes involving patents/trade marks (excluding administrative actions)	DA/IA	Sum of the following scores: (a) Yes = 0.25, No orN/A = 0 (b) Yes = 0.25, No or N/A = 0 (c) Yes = 0.25, No or N/A = 0 (d) Yes = 0.25, No or N/A = 0
4. Under your national law, is an arbitration agreement severable from the main contract? In other words, if one party alleges that the main contract is invalid, may the arbitration agreement included in that contract nevertheless be deemed valid?	DA/IA	Yes = 1, No or N/A = 0
5. Can an arbitration agreement be incorporated by reference (when the arbitration agreement is set out in a separate document that is referred to in the main agreement)?	DA/IA	Yes = 1, No or N/A = 0
6. Can the following method of concluding an agreement constitute a binding arbitration agreement? (a) by electronic communication, including email (b) by fax (c) by oral agreement (d) by conduct	DA/IA	Sum of the following scores: (a) Yes = 0.25, No or N/A = 0 (b) Yes = 0.25, No or N/A = 0 (c) Yes = 0.25, No or N/A = 0 (d) Yes = 0.25, No or N/A = 0
7. Have the courts in your country stated a pro-arbitration policy, i.e., a general policy in favor of enforcing arbitration agreements and arbitration awards, in applying your national law of arbitration in domestic/international arbitrations taking place in your country?	DA/IA	Yes = 1, No or N/A = 0
8. Does your national law expressly provide that all arbitrators must be independent and impartial in a domestic arbitration?	DA	Yes = 1, No or N/A = 0
9. Does your national law provide for your courts to assist the arbitrators or parties by granting interim relief to prevent immediate and irreparable injury while the arbitration is pending or before the arbitration has commenced in domestic arbitrations taking place in your country?	DA	Yes = 1, No or N/A = 0
10. Under your national law, are the state and state entities allowed to enter into arbitration with foreign owned companies in connection with the following? (a) Concession agreements (b) Infrastructure contracts	IA	Sum of the following scores: (a) Yes = 0.33, No or N/A = 0 (b) Yes = 0.33, No or N/A = 0

Question	DA or IA	Scoring
(c) Contracts dealing with natural resources		(c) Yes = 0.33, No or N/A = 0
11. Does your national law expressly provide that all arbitrators must be independent and impartial in an international arbitration?	IA	Yes = 1, No or N/A = 0
12. Does your national law provide for your courts to assist the arbitrators or parties by granting interim relief to prevent immediate and irreparable injury while the arbitration is pending or before the arbitration has commenced in international arbitrations taking place in your country?	IA	Yes = 1, No or N/A = 0
B. The Enforcement Regime		
13. If the parties have expressly agreed (i.e., in writing) that the arbitration tribunal can rule on its own jurisdiction, will that be upheld by your national courts?	DA/IA	Yes = 1, No or N/A = 0
14. May a judgment of that court enforcing the award be appealed to a higher court or courts?	DA/IA	No = 1, Yes or N/A = 0
15. Under your national law, can a domestic award rendered in favor of a local company be denied confirmation or enforcement, or be set aside, annulled, or vacated by a court in your country on the following grounds? (a) Invalidity of the underlying arbitration agreement or lack of capacity of a party (b) Lack of a fair hearing (c) Award deals with matters outside the scope of the arbitraton agreement (d) Arbitration procedures not in accordance with the parties' s agreement or the governing arbitration law (e) Subject matter of the dispute not subject to arbitration (f) Enforcement of the award would be contrary to country's public policy (g) Error of law (h) Award not supported by substantial evidence	DA/IA	Sum of the following scores: (a) No = 0.125, Yes or N/A = 0 (b) No = 0.125, Yes or N/A = 0 (c) No = 0.125, Yes or N/A = 0 (d) No = 0.125, Yes or N/A = 0 (e) No = 0.125, Yes or N/A = 0 (f) No = 0.125, Yes or N/A = 0 (g) No = 0.125, Yes or N/A = 0 (h) No = 0.125, Yes or N/A = 0
16. In arbitrations involving a state or state entity, can your court(s) review the arbitration award on its merits in connection with recognition and enforcement proceedings?	DA/IA	No = 1, Yes or N/A = 0
17. Has your country ratified the following Conventions? (a) The New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards (b) The ICSID Convention	IA	Sum of the following scores: (a) Yes = 0.5, No or N/A = 0 (b) Yes = 0.5, No or N/A = 0
18. Under your national law, may a foreign arbitral award be denied recognition or enforcement by a court in your country on the following grounds? (a) Invalidity of the underlying arbitration agreement or lack of capacity of a party (b) Lack of a fair hearing (c) Award deals with matters outside the scope of the arbitraton agreement (d) Arbitration procedures not in accordance with the parties' agreement or the governing arbitration law	IA	Sum of the following scores: (a) No = 0.125, Yes or N/A = 0 (b) No = 0.125, Yes or N/A = 0 (c) No = 0.125, Yes or N/A = 0 (d) No = 0.125, Yes or N/A = 0

Question	DA or IA	Scoring
(e) Subject matter of the dispute not subject to arbitration (f) Enforcement of the award would be contrary to country's public policy (g) Error of law (h) Award not supported by substantial evidence		(e) No = 0.125, Yes or N/A = 0 (f) No = 0.125, Yes or N/A = 0 (g) No = 0.125, Yes or N/A = 0 (h) No = 0.125, Yes or N/A = 0
19. May a judgment of that court enforcing or denying enforcement of the foreign award be appealed to a higher court?	IA	No = 1, Yes or N/A = 0
C. The Efficiency of Enforcement		
20. Are there any arbitration institutions administering commercial arbitrations in your country?	DA/IA	Yes = 1, No or N/A = 0
21. Is there a public authority designated to handle administrative, logistical and other issues related to investors disputes with the state or a state entity (e.g., specific agency, office of the Prime Minister, etc.)?	DA/IA	Yes = 1, No or N/A = 0
22. If an immediate need can be shown, how often do courts grant interim relief requests for assistance?	DA/IA	In nearly all cases = 1, Usually = 0.5, Rarely or N/A = 0
23. How long, typically, would you estimate the period to be from the filing of the request for arbitration to the constitution of the arbitration tribunal in a domestic arbitration?	DA	Under 30 days = 1, 31-180 days = 0.66, 181-1 year = 0.33, Over 1 year or N/A = 0
24. How long, typically, would you estimate the period to be from the first hearing of the arbitration tribunal to the rendering of the arbitration award in a domestic arbitration in your country?	DA	Under 30 days = 1, 31-180 days = 0.66, 181-1 year = 0.33, Over 1 year or N/A = 0
25. If a party brings an action in a court of your country with respect to a dispute that the parties have agreed should be arbitrated, how frequently would the courts in your country decline to hear the case and refer the parties to arbitration in domestic arbitrations taking place in your country?	DA	In nearly all cases = 1, Usually = 0.5, Rarely or N/A = 0
26. How long, typically, would you estimate the period to be from the filing of the request for arbitration to the constitution of the arbitration tribunal in an international arbitration?	IA	Under 30 days = 1, 31-180 days = 0.66, 181-1 year = 0.33, Over 1 year or N/A = 0
27. How long, typically, would you estimate the period to be from the first hearing of the arbitration tribunal to the rendering of the arbitration award in an international arbitration in your country?	IA	Under 30 days = 1, 31-180 days = 0.66, 181-1 year = 0.33, Over 1 year or N/A = 0
28. If a party brings an action in a court of your country with respect to a dispute that the parties have agreed should be arbitrated, how frequently would the courts decline to hear the case and refer the parties to arbitration in international arbitrations taking place in your country?	IA	In nearly all cases = 1, Usually = 0.5, Rarely or N/A = 0
29. What is the likelihood that your courts would enforce a foreign arbitral award if no objection to agreement were filed?	IA	In nearly all cases = 1, Usually = 0.5, Rarely or N/A = 0

Appendix D Data and Measure

D.1 Formal Institutions, Rule of Law, and Informal Institutions

Formal institutions are measured using the Polity IV dataset, developed by Marshall et al. (2014), covering 167 countries during the time span of 1800–2013. I use the variable of the executive constraints, which refers to "the extent of institutionalized constraints on the decision making powers of chief executives, whether individuals or collectivities." For this analysis, the values of this variable that ranges from 1 to 7 are averaged from 2005 to 2010. When an executive's behavior is well-constrained by formal institutions, extortion by government can occur less, and property rights can be more protected. Thus, as this measure is higher, the enforcement of a contract between traders is expected to be strengthened.

The rule of law index, ranging from -2.5 to 2.5, was constructed by Kaufman et al. (2010). It captures the degree to which agents have confidence in the rule of their society, including contract enforcement and property rights. To employ this index for estimation, I average each country's indices from 2005–2010. I also add 2.5 to the original measure so that the index ranges from 0 to 5, allowing for converting it into natural logarithm form.

Informal institutions are captured by culture following Williamson (2009) and Williamson and Kerekes (2011), since culture, formed over generations, constrains individual behavior. To construct the measure for culture, I consider three aspects: trust, control, and obedience.[34]

A higher trust in others, a stronger belief in controlling the direction of life, and a lower obedience can contribute to the higher enforcement of a contract. When people trust each other, the opportunism of the parties can be overcome, leading a contract to be more respected. When people feel that they have more ability to control the way life turns out, they might make more effort to reach their goals, which can make them cooperate better. Even if a trader pursues opportunism to maximize profit, individuals who engage in arbitration can

[34]These three aspects of culture have been considered by previous research, such as Tabellini (2010) and Williamson and Kerekes (2011).

take more care to resolve commercial disputes and enforce a contract. Obedience tends to be considered as a virtue in a coercive and hierarchical society (Tabellini, 2010, p. 685). In such an environment, people might not be less interested in innovation and pursuing economic profit, which can lead them to be more passive in cooperating.

These three aspects are measured using the 2005–2009 World Value Survey (WVS) and the 2005-2008 European Value Survey (EVS).[35] First, trust is measured using the following question: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" Then, the measure for trust is calculated as the number of respondents who answered "Most people can be trusted" divided by the sum of the respondents who answered "Most people can be trusted" and "Can't be too careful." Secondly, control is measured based on the following question: "Some people feel they have completely free choice and control over their lives, while other people feel that what we do has no real effect on what happens to them. Please use this scale where 1 means 'none at all' and 10 means 'a great deal' to indicate how much freedom of choice and control you feel you have over the way your life turns out." The measure for control is the average of the answers of respondents divided by 10. Lastly, obedience is measured using the following question: "Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important?" Then, obedience is measured as the share of the number of the respondents who chose "obedience" out of the number respondents. Other options are independence, hard work, feeling of responsibility, imagination, tolerance and respect for other people, thrift saving money and things, determination and perseverance, religious faith, and unselfishness.

The comprehensive measure for informal institutions is constructed by the sum of trust, control, and '1 less obedience.' Thus, a higher level of this measure is expected to lead to stronger contract enforcement.

[35]The following selected questions have been used by many researchers, e.g., see Tabellini (2010).

D.2 Other Variables

The 2010 wage data come from the ILO Global Wage Database underlying the ILO (2015) Global Wage Report 2014/15, which were downloaded at http://www.ilo.org/travail/info/db/lang–en/index.htm. I use the wage data that were calculated by the average nominal monthly earnings expressed in local currency based on all employees regardless of hours worked. The nominal values are converted into US dollars by market exchange rates that were used by Timmer et al. (2015) to construct the WIOD. The exchange rates were obtained at http://www.wiod.org. The 2010 data on population (in millions) and output-side real GDP are from the Penn World Table (PWT) 8.1 constructed by Feenstra et al. (2015). The GDP is adjusted at the current PPP. The 2010 data on the index of human capital per person also come from the PWT 8.1. Specifically, the human capital index is calculated as $e^{\phi(s_{it})}$, where s_{it} is the average years of schooling for the population aged 15 and older from Barro and Lee (2013). The function $\phi(s)$ was chosen based on Psacharopoulos (1994). The fixed cost that captures innovation cost is measured by the 2010 capital expenditure share for R&D out of GDP, which is from the World Bank's World Development Indicators (WDI). Data on the landlocked status are from the CEPII's GeoDist database, constructed by Mayer and Zignago (2011). The measure for financial development is the 2008 private credit by financial intermediaries scaled by GDP following Beck (2003). This measure exists as a variable of "private credit by deposit money banks and other financial institutions to GDP" in the Financial Development and Structure Dataset constructed by Beck et al. (2000, 2009) and Cihak et al. (2012).