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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.

To be clear, building on Antras (2003, 2005), I analyze the e ects 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 nal 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 a ects a rm's ex-ante opportunistic behavior.

I focus on transactions between an intermediate input supplier (IIS) and a nal 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 Antras 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

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 di erent step by considering relationship-speci city and the incomplete enforcement of arbitral awards as a setting for examining global sourcing patterns.

This paper also builds on the literature on rm 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, rm 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 Antras (2003, 2005) and Antras and Helpman (2004), illustrating how incomplete contracts a ect a rm's organization mode between vertical integration and outsourcing. This literature tends to assume non-veri ability of investments that leads to non-contractibility. Hence, this non-veri ability assumption does not give room for examining contract enforcement. When partial-veri ability is allowed, veri able investments are contractible and contract enforcement is assumed to be automatically achieved (Grossman and Helpman, 2005).

Since commercial arbitration hinges on contracts, which I will explain later, this portion is not a ected by commercial arbitration regimes. On the contrary, the veri able 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 veri ability assumption ensures that a rm's opportunistic behavior arises solely due to the imperfect arbitration regimes, which simpli es the analysis of the e ect of the quality of commercial arbitration regimes on rm behavior.

The enforcement issue matters even in the case where intermediate inputs are sourced from an integrated rm within a multinational rm's boundary. If a country's arbitration regimes do not support enforcing an arbitral award, the nancial 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 rm'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 de ned 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 wo cover matters tesesttes ateseion81(in)28(4-CI9e-61(teseCITRAL2i

The de nition 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] Speci cally, there are four conditions under which an arbitration is considered international: i) the places of business of the parties are in di erent 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, de ned 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 rm. 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

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.

stantial portion of variation that may generate reverse causality. Speci cally, 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 rms 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 di erentiated varieties, $!$, of a single good, y. A representative consumer in country j maximizes the following utility function:

$$u_j = \left[\int_{!=0}^{n_i} y_{ij}(!)^{\frac{-1}{}} d! + \int_{!=0}^{n_j} y_{jj}(!)^{\frac{-1}{}} d! \right]^{\frac{}{-1}}; \qquad (1)$$

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

can produce low-quality R and N components with negligible e ort 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 nal 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 nal 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 Antras 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

FGP who initially paid less than V, this full veri ability 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 nancial 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 $D_i \; 2 \; (0;1)$ and $A_i \; 2 \; (0;1)$, 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 nally 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

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

Arbitral award paid by a respondent + initial payment by a respondent = VA_iA_j: (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

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

$!$ by an FGP in j, and $y_j(!)$ is the total number of final goods that are produced by the FGP in j and consumed by consumers in both countries, implying that $y_j(!) = y_{ji}(!) + y_{jj}(!)$. 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, $p_{ji}(!) = p_{jj}(!)$ in equation (2), and henceforth $p_j(!)$, the price of the variety of w charged by an FGP in j, is used to indicate $p_{ji}(!)$ and $p_{jj}(!)$.

Now, the FGP in j plans to source $x(!)$ units of intermediate input to produce $y_j(!)$ units of the final good. The unit labor requirement of R, N, and x implies that for the production of $x(!)$ units of the intermediate input, the number of labor demanded is $x(!)$, which should be the sum of the quantity demanded of R and N. Under this condition, to produce $x(!)$ units of the intermediate input using the technology in equation (4), an IIS produces $x(!)$ units of R and $(1 \quad)x(!)$ 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 $y_j(!) = x(!)$ imply that when producing $y_j(!)$ units of y, the production of $y_j(!)$ units of them is contributed by R, while the production of $(1 \quad)y_j(!)$ units of them is contributed by N. Thus, without opportunistic behavior, the values of investment of $x(!)$ units of R and $(1 \quad)x(!)$ units of N are $p_j(!)y_j(!)$ and $(1 \quad)p_j(!)y_j(!)$, 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 $x_{ij}(!)$ 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 $p_j(!)y_j(!)A_iA_j$, the IIS will initiate an arbitration. Then, the FGP will have to pay a part of the resulting award, which is the difference between $p_j(!)y_j(!)A_iA_j$ and the value that was initially paid to the IIS, so that the IIS will ultimately receive $p_j(!)y_j(!)A_iA_j$

from the FGP. If the FGP pays more than $p_j(!)y_j(!)A_iA_j$ but less than $p_j(!)y_j(!)$, 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 $p_j(!)y_j(!)A_iA_j$, 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 pro t opportunity. Therefore, for the FGP, the optimal payment for the investment of $x_{ij}(!)$ units of R is $p_j(!)y_j(!)A_iA_j$.

Intuitively, as A_iA_j rises, parties have more disputes because a party that su ers a nancial loss due to another party's opportunistic behavior is more likely to depend on arbitration, while expecting that her nancial 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 nancial loss.

Returning to the sourcing problem of the intermediate input, the IIS should produce $(1 \quad)x_{ij}(!)$ 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 di erence in terms of relationship-speci city from the component R, traders are assumed to nd 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 $(1 \quad)p_j(!)y_j(!)$, 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 $(1 \quad)p_j(!)y_j(!)A_iA_j$ 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 $(1 \quad)x_{ij}(!)$ units of N is $(1 \quad)p_j(!)y_j(!)$.

Again, expecting this payment from the FGP, the IIS chooses the value of $(1 \quad)x_{ij}(!)$ units of N. If the IIS produces the component that is worth less than $(1 \quad)p_j(!)y_j(!)$, the FGP will end the transaction with the IIS and buy the component from another rm 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 $(1 \quad)x_{ij}(!)$ units of N is $(1 \quad)p_j(!)y_j(!$

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 a ects the rms' behaviors. Using the same techniques, the ex-ante revenue for the IIS from producing $x_{jj}(!)$ units of R is $p_j(!)y_j(!)D_j$, and the probability of a dispute regarding the R component is D_j. The ex-ante revenue from producing (1 $)x_{jj}(!)$ units of N is (1 $)p_j(!)y_j(!)$, and the probability of a dispute regarding the N component is zero.

To summarize these rms' behaviors, arbitration acts as an outside option for a party that

pro t maximization for the IIS in i yields the following optimal price:

$$p_j^G(!) = \frac{w_i + w_j}{1 \quad (1 \quad A_i A_j)} \frac{}{1}; \tag{8}$$

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

Compared to the well-known optimal price level under perfect contract enforcement, which is $(w_i + w_j)\frac{}{1}$, the price is in ated by $\frac{1}{1 \quad (1 \quad A_i A_j)}$ due to the opportunistic behaviors between the FGP and IIS. However, the opportunism is mitigated by the e ective international commercial arbitration regime of country i and j: $\frac{@p_j^G(!)}{@A_i} < 0$, and $\frac{@p_j^G(!)}{@A_j} < 0$. Additionally, $\frac{@^2 p_j^G(!)}{@A_i @} < 0$, and $\frac{@^2 p_j^G(!)}{@A_j @} < 0$, implying that the bene cial e ect of the arbitration-friendly legal system on the price increases with rs intensity, .

The FGP expects FGP 3.294 0 Td [(!)]TJ/F11.96 15.016]TJ/F11aTJ/F11lump-sumTd [(!)ransf[(whr

on this price for the FGP are equal to

$$_{jj}(!) = (\ _i + \ _j)(\quad 1)^{\ 1} \quad (2w_j)^1 \quad [1 \quad (1 \quad D_j)] \ : \tag{11}$$

Concerning the choice between the global and domestic sourcing, a mixed equilibrium where both global and domestic sourcing arise in j exists only if $_{ij}(!) = \ _{jj}(!)$, implying that $\frac{2w_j}{w_i+w_j}^{\ 1\ \ \underline{1}} = \frac{1 \quad (1 \quad D_j)}{1 \quad (1 \quad A_iA_j)}$: 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 $_{ij}(!) > \ _{jj}(!)$, implying that

$$\frac{2w_j}{w_i + w_j}^{\ 1\ \ \underline{1}} > \frac{1 \quad (1 \quad D_j)}{1 \quad (1 \quad A_iA_j)}. \tag{12}$$

The left-hand side of this inequality (12) shows the bene t of choosing global sourcing, while the right-hand side shows the opportunity cost under this choice. Speci cally, a high wage gap is a bene t 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 bene t from the choice outweighs the opportunity cost.[15]

Let $(\ ) \quad \frac{2w_j}{w_i+w_j}^{\ 1\ \ \underline{1}} \quad \frac{1 \quad (1 \quad D_j)}{1 \quad (1 \quad A_iA_j)}$: Then, the FGP in j chooses global sourcing when $(\ ) > 0$, and the higher $(\ )$, 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, $\frac{@\ (\ )}{@} < 0$ with the assumption that $D_i \quad A_i$. This implies that the FGP will

[15] The condition under which global sourcing is chosen over domestic sourcing by j's FGP, $_{ij}(!) > \ _{jj}(!)$, also implies the following inequality: $A_iA_j > \frac{(1 \quad + \ D_j)\ \frac{w_j+w_j}{2w_j}^{\ 1\ \ \underline{1}}}{1} + 1$. Since $\frac{w_i+w_j}{2w_j}$ strictly increases in $\frac{w_i}{w_j}$, the right-hand side captures the wage bene t of domestic sourcing, while considering the mitigation of opportunism through D_j. Thus, only when A_iA_j is greater than the bene t of domestic sourcing, under the assumption of $D_j \quad A_j$, j's FGP chooses global sourcing. To put it di erently, 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, $\frac{@\ (\ )}{@A_i} > 0$, and $\frac{@\ (\ )}{@A_j} > 0$. A higher A_i or A_j attracts more global sourcing. Additionally, $\frac{@^2\ (\ )}{@A_i@} > 0$, and $\frac{@^2\ (\ )}{@A_j@} > 0$.[16] That is, the positive e ect of international arbitration regimes of each country on the attractiveness of global sourcing rises with . This is because as the greater part of producing the intermediate input is vulnerable to opportunism, the e ect of a rise in A_i or A_j on the mitigation of the risk becomes higher. It is straightforward to show that the e ect of D_j on ( ) is the opposite: $\frac{@\ (\ )}{@D_j} < 0$, and $\frac{@^2\ (\ )}{@D_j@} < 0$. That is, a higher quality of domestic arbitration regime decreases the attractiveness of the global sourcing, and this impact increases with .

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.

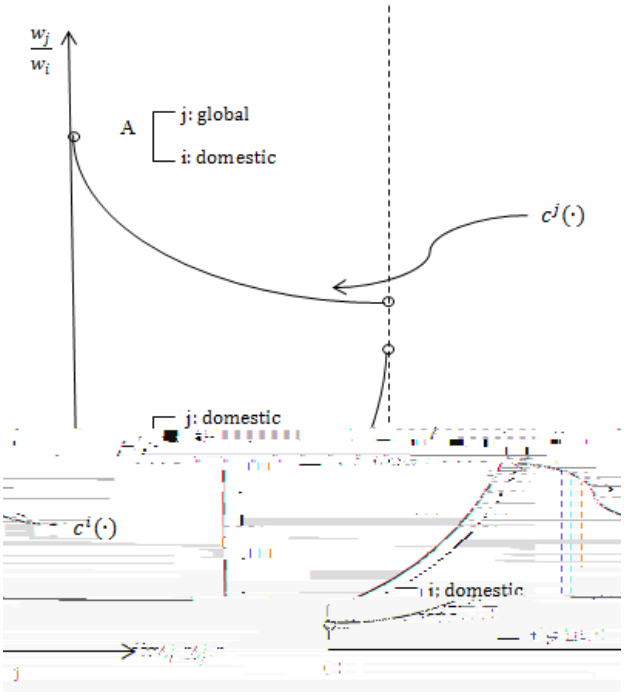
Proposition 1. *When the FGP in one country chooses global sourcing, the FGP in the other country chooses domestic sourcing.*

Proof. The rst 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 $x(>0)$; $\frac{w_i+w_j}{2w_j} \quad \frac{2w_i}{w_i+w_j} = \frac{1+x}{2x} \quad \frac{2}{1+x} = \frac{(x\ \ 1)^2}{2x(x+1)} > 0$. Next, inequality (12) implies that $\frac{w_i+w_j}{2w_j}^{\ 1\ \ \frac{1}{}} < \frac{1\ \ (1\ \ A_iA_j)}{1\ \ (1\ \ D_j)}$. Under the assumption that $D_i \quad A_i$ and $A_j \ 2\ (0;1)$, $A_iA_j < D_i$, which implies that $\frac{1\ \ (1\ \ A_iA_j)}{1\ \ (1\ \ D_j)} < \frac{1\ \ (1\ \ D_i)}{1\ \ (1\ \ D_j)}$*:* Addition-

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

ally, under the assumption that $D_j \quad A_j$ and $A_i \ 2 \ (0;1)$, $A_i A_j < D_j$, which implies that $\frac{1 \quad (1 \quad D_i)}{1 \quad (1 \quad D_j)} < \frac{1 \quad (1 \quad D_i)}{1 \quad (1 \quad A_i A_j)}$. Taken together, it is straightforward to draw the following inequality under which the FGP in i chooses the domestic sourcing: $\frac{2w_i}{w_i + w_j}^{\ 1 \ \frac{1}{}}$

Figure 1: Choice of Sourcing Mode



following discussion remain the same with A_i.

Turning to the perspective of the FGP in i, its cuto curve is shown as follows: $\frac{w_j}{w_i} = c^i(\ ) \quad 2\left(\frac{1 + A_iA_j}{1 + D_i}\right)^{\overline{1}} \quad 1$. Let us only consider $h^i(\ ) \quad (1 + A_iA_j)^{\overline{1}}$, which determines the shape of $c^i(\ )$ over A_j. Since $\frac{@h^i(\ )}{@A_j} > 0$ and $\frac{@^2h^i(\ )}{@A_j^2} > 0$, $c^i(\ )$ 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 cuto curve over A_j implies that the decreasing cost of international arbitration with A_j makes $\frac{w_i}{w_j}$, which generates the indi erent choice between the two sourcing modes, fall. Then, the FGP nds it pro table to choose global sourcing only when the combination of A_j and $\frac{w_j}{w_i}$ is below the cuto 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 $\frac{w_j}{w_i} > 2\left(\frac{1 + A_iA_j}{1 + D_i}\right)^{\overline{1}} \quad 1$. Conversely, in the case where the FGP in i chooses domestic sourcing, the FGP in j chooses domestic sourcing only if $\frac{w_j}{w_i} < 2\left(\frac{1 + A_iA_j}{1 + D_j}\right)^{\overline{1}} \quad 1^{1}$. 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, $c^j(\ )$ should be greater than or equal to $c^i(\ )$. Otherwise, the two cuto curves intersect, creating a region in which the choices made by the FGPs in i and j contradict each other. Note, also, that if $2\left(\frac{1+A_iA_j}{1+D_j}\right)^{-1}-1$ 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 cuto curve is always less than $\frac{w_j}{w_i}$, which is greater than 0. Conversely, if $2\left(\frac{1+A_iA_j}{1+D_i}\right)^{-1}-1$ is less than or equal to 0, i's FGP chooses domestic sourcing since $\frac{w_j}{w_i}$ on i's FGP's cuto curve is less than $\frac{w_j}{w_i}$, which is greater than 0. For simplicity, I only consider the cases in which a cuto curve does not intersect the horizontal axis. This requires that the minimum value of $c^i(\ )$ with A_j or A_i of 0 should be greater than or equal to 0, implying that $\left(\frac{1}{1+D_i}\right)^{-1}\frac{1}{2}$.

These two cuto conditions for the choice of sourcing mode for j and i show that the region in which the FGP of j chooses global sourcing is exp7mm3ed-345(a)s-346(i)-27(e(g)-394(mo)

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 $x_{ij}(!)$ units of x, is equal to the number of FGPs in j, n_j, and the number of IISs, each of which produces $x_{ii}(!)$ units of x, equals the number of FGPs in i, n_i. Additionally, for the sales of the final good, $y_i^D(!)$, 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 $x_{ij}(!)n_j + x_{ii}(!)n_i + y_i^D(!)n_i + f_i n_i = L_i$. Since $x_{ij}(!) = y_j^G(!) = y_{ji}^G(!) + y_{jj}^G(!)$, and $x_{ii}(!) = y_i^D(!) = y_{ij}^D(!) + y_{ii}^D(!)$, the labor market clearing condition can be written as follows:

$$(\ _i + \ _j) \ \frac{1}{\quad} \ (w_i + w_j) \ (\ A_i A_j + 1 \ ) \ n_j + 2(2w_i) \ (\ D_i + 1 \ ) \ n_i \ + f_i n_i = L_i: \tag{14}$$

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, $y_j^G(!)$, the labor market clearing condition in j dictates that $y_j^G(!)n_j + f_j n_j = L_j$. Using $y_j^G(!) = y_{ji}^G(!) + y_{jj}^G(!)$, this condition can be expressed as follows:

$$(\ _i + \ _j) \ \frac{1}{\quad} \ (w_i + w_j) \ (\ A_i A_j + 1 \ ) \ n_j + f_j n_j = L_j: \tag{15}$$

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, $_{ij}(!) = w_j f_j$, and $_{ii}(!) = w_i f_i$, implying

$$(\ _i + \ _j)(\ 1) \ ^{1} \ (w_i + w_j)^{1} \ [1 \ (1 \ A_i A_j)] \ = w_j f_j; \tag{16}$$

$$(\ _i + \ _j)(\ 1) \ ^{1} \ (2w_i)^{1} \ [1 \ (1 \ D_i)] \ = w_i f_i: \tag{17}$$

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

ratio:

$$\frac{w_j}{w_i}\left(\frac{1}{2}\left(1+\frac{w_j}{w_i}\right)\right)^{1}=\left(\frac{A_iA_j+1}{D_i+1}\right)\left(\frac{f_i}{f_j}\right); \tag{18}$$

Meanwhile, j's zero pro t condition in equation (16) and labor market clearing condition in j in equation (15) pin down n_j as follows:

$$n_j=\frac{L_j}{f_j}\left(1-\left(\frac{1}{\frac{w_i}{w_j}+1}\right)\right); \tag{19}$$

In addition, i's zero pro t 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:

$$n_i=\frac{L_i}{f_i}\left(\frac{L_j\left(\frac{w_j}{w_i}+1\right)^2}{\frac{w_i}{w_j}+1}+1\right)^{1}; \tag{20}$$

Thus, once $\frac{w_j}{w_i}$ is implicitly determined by the parameters in equation (18), n_j and

In addition, i

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

4.1.1 Wage Ratio and Commercial Arbitration Regimes

The e ects 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 e ects are examined by looking at how the right-hand side (RHS) responds to changes in those parameters. Let the RHS be a function of $q(\ )$. Then, it is straightforward to show that $\frac{@q(\ )}{@A_i}$ and $\frac{@q(\ )}{@A_j}$ are greater than 0, while the signs for $\frac{@^2q(\ )}{@A_i@}$ and $\frac{@^2q(\ )}{@A_j@}$ are ambiguous. Similarly, $\frac{@q(\ )}{@D_i}$ is less than 0, while the sign for $\frac{@^2q(\ )}{@D_i@}$ is ambiguous. It is also straightforward to show that $\frac{@q(\ )}{@} < 0$ by using the assumption that $D_i \quad A_i$. 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,* $\frac{@\ \frac{w_j}{w_i}}{@A_i} > 0; \frac{@\ \frac{w_j}{w_i}}{@A_j}_{\ i} > 0; {}^{@}{}^{w}$

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 $c^j(\ )$ and $c^i(\ )$ 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, $\frac{@\ \frac{w_j}{w_i}}{@}$ is consistently negative, which implies that as the risk of opportunism increases with , 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: $(\ A_iA_j + 1\ )\ p_j^G(!)y_{ji}^G(!) + ms02Td\ [\ (\ y\ )\ ]TJ/F51\ 7\ Tf\ 7.718\ 0\ Td$

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 . The sign for $\frac{@^2 \frac{M_{ij}}{M_{ii}}}{@A_i@}$, $\frac{@^2 \frac{M_{ij}}{M_{ii}}}{@A_j@}$, and $\frac{@^2 \frac{M_{ij}}{M_{ii}}}{@D_i@}$ 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 ows for the nal good from i to j. This is also interpreted as the total sales of the nal good, produced by country i's FGPs, in j. Y_{ij} is calculated by $n_i y_{ij}^D(!)p_i^D(!)$. Similarly, Y_{jj}, the total sales of y in j, is calculated by $n_j y_{jj}^G(!)p_j^G(!)$. Then, Y_j, the value of the nal 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 $Y_{ji} = n_j y_{ji}^G(!)p_j^G(!)$ and $Y_{ii} = n_i y_{ii}^D(!)p_i^D(!)$. Then, the international sales f 105!:!

Proposition 3. *When the FGP in j chooses global sourcing, and the FGP in i chooses domestic sourcing,* $\frac{@\ \frac{M_{ij}}{M_{ii}}}{@A_i} > 0$, $\frac{@\ \frac{Y_{ij}}{Y_{ii}}}{@A_i} > 0$, $\frac{@\ \frac{Y_j}{Y_i}}{@A_i} > 0$, *and* $\frac{@\ \frac{U_j}{U_i}}{@A_i} > 0$. *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 .*

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 rm's entry decision.

I consider both partial and general equilibrium e ects. In partial equilibrium, I assume that the wage ratio is exogenous to the rm. Firms choose global sourcing over domestic sourcing in this scenario. The directions of these e ects are determined by ( ) 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 rms to respond to the wage ratio when the quality of arbitration regimes changes. The directions of these e ects 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 e ects do not ip the sourcing modes of the rms, as discussed in Section 4.1.1. Only the partial equilibrium e ects change

Table 1: The directions of the main variables' e ects on M_{ij}=M_{ii}

Two situations determining M_{ij}=M_{ii})	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.)	Partial equilibrium e ects	General equilibrium e ects
Related eq. or ineq.)	(:) from ineq. (12)	Eqs. (18) and (21)
A_i	+	+
A_j	+	+
D_j		n/a
D_i	n/a	
A_i	+	ambiguous
A_j	+	ambiguous
D_j		n/a
D_i	n/a	ambiguous

Notes: The e ect 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 e ects reinforces the predictions regarding D_i and D_j in this table. Therefore,

A_i , A_j , and D_i are ambiguous through general equilibrium e ects.

5 Empirical Speci cation

In this section, and the following sections, I focus on empirically examining the e ects 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:

$$ln\left(\frac{M_{ij}}{M_{ii}}\right)^{z} = {}_0 + {}_1{}^{z} + {}_2 lnA_i + {}_3 lnA_j + \quad + {}^{j} +$$

perfect multicollinearity between ^{z} and ^{z}. The country pair xed e ect $_{ij}$ captures the average di erence in trade ows between country pairs regardless of who exports or imports a good. In a country pair in $_{ij}$, 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 coe cients on A_i and D_i seize the e ects of the quality of other types of institutions, I add formal and informal institutions as a control variable. The former is de ned as political constraints on government behavior, and the latter is de ned 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 coe cients on A_i and D_i could capture the impact of human capital abundance that is a potential determinant for constructing arbitration regimes. Finally, nancial development is included as a control variable since nancial development can be achieved based on high-quality legal institutions in which arbitration regimes exist. Additionally, IISs in the nancially developed countries could export intermediate inputs more by overcoming high xed costs, and FGPs in the nancially developed countries could take better advantage of cheaper inputs from a foreign country by nancing 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 ows of intermediate inputs are from the 2010 World Input-Output Database (WIOD) constructed by Timmer et al. (2015). I use the trade ows that occur when goods are used as intermediates for an industry, not when goods are used as nal goods. The values of the trade ows are expressed in millions of US dollars. The dataset covers all such ows 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 o cial 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 de nition 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 e ciency of enforcement. Speci cally, 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 speci c 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).

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 di erent 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 o ce 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-speci c aggregate index for each domestic and international arbitration regimes' quality, for each category, I rst 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-speci c 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 e ciency 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 e ects 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.

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-Speci city Intensity

Table 3: A hypothetical example of *rs* intensity

Input	SITC	1 if input is R, o.w., 0 (A)	Source country	The Chilean rm Input share (B)	(A) (B)	The French rm 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 ^{z}, consider a Chilean rm producing a jam gift collection. Now, the rm needs to source a jar of grape jam to complete its jam collection. As Table 3 shows, the rm can source it either from a domestic fruit jam rm or a French jam rm. No matter who produces the jar of grape jam, for the production of one unit of it, a rm 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 classi cation of commodities by Rauch (1999), the sugar (SITC 0619), jar (SITC 6651), and pectin (SITC 0730) are classi ed as *R* input requiring an *rs*

Even though the two rms use the same inputs, the French jam rm more intensively uses a jar and less intensively uses fresh grapes than the Chilean rm. 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 rm 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^0 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 classi cation is the same as z^0 is

$$^{z} = {}^{z^0} = \sum_{i} \sum_{p} \sum_{s} {}^{z^0}_{i} \, {}^{pz^0}_{si} r_p; \tag{23}$$

where ${}^{pz^0}_{si}$ is the share of input industry p, sourced from country s, within an output industry z^0 of country i. The subscript s can be the same as i. ${}^{pz^0}_{si}$ is calculated by the value of p, sourced from s, in z^0 divided by the total value of all inputs in z^0 of country i, using the WIOD in 2010. As a robustness check, I use the 2005 WIOD, which is presented in Section 7.2. ${}^{z^0}_{i}$ is country i's output share in industry z^0. r_p is the degree of relation-speci city for the transaction of input p. Based on the classi cation of Rauch (1999), if an input is neither traded on organized exchanges nor reference priced, then the input is de ned as an input that requires an *rs* transaction.[26] Rauch's data, which I obtained from his homepage, were revised in 2007.

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

si cation (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 rst 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. Speci cally, 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 classi ed 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 ows in the WIOD are organized. After adjusting repeated codes for the same reason, I have the uniquely classi ed 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 *2* (0*;*1) is built. Speci cally, 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 identi ed.

[28]In the uniquely classi ed set of codes (4-digit SITC revision 2, 2-digit ISIC revision 3), an SITC code

Table 4: Industry-level *rs* intensity

ISIC code	ISIC description	z
23	Coke, Re ned 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

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 de nition and descriptive statistics

		1. Country level				
Variable	Variable de nition	obs	mean	sd	min	max

(*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 signi cance 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 de nition 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 ^{z} to lnD_j are statistically signi cant and consistent with expectations. When controlling for formal and informal institutions in column (2), the magnitude of the estimated coe cients on the quality of commercial arbitration regimes falls as expected, but they are still statistically signi cant. The e ects of the main variables and the statistical signi cance 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 insigni cant except $^{z}lnA_j$. However, the signs of the insigni cant interactions terms, $^{z}lnA_i$ and $^{z}lnA_j$, are consistent with the predicted directions of their e ects on relative global sourcing through a rm's entry decision, as presented in Table 1.

The individual e ects can also be quanti ed using the estimates in column (4) by holding other variables xed at their mean values. For instance, the association of ^{z} and relative global sourcing is 2.836 (= 3.829+(2.968+4.867) (0.381)+(10.798 0.547) (0.359)). The signs of the e ects of other variables, which are obtained using the same method, are consistent with expectations, and the magnitudes of the e ects 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)
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)
$^z lnA_i$				2.968	2.936
				(10.198)	(10.211)
$^z lnA_j$				4.867*	4.882*
				(2.706)	(2.707)
$^z lnD_i$				10.798	10.849
				(10.489)	(10.499)
$^z lnD_j$				-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 signi cant 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 rm's avoidance of global sourcing as the *rs* intensity of input industry rises.

It is interesting that the estimates on nancial development and human capital are negative and statistically signi cant in every column. That is, as a source country and destination country have a better nancial system and more skilled labor, global sourcing relative to the source country's domestic sourcing tends to decrease. The estimation results might imply that rms are more attracted to domestic sourcing than global sourcing, as an economy saves extra costs by using a high-quality nancial system and human capital. This might be because nancial 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 nancial 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 coe cients are all positive, but the estimated coe cients on them are not statistically signi cant. Setting aside the statistical signi cance matter, these positive signs of the estimates imply that foreign transactions require a higher quality of formal and informal institutions and parties' greater con dence in rule of law than domestic transactions. These institutions are more directly related to mitigating opportunism than human capital and nancial 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 a ected 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 in uence the current level of the quality of domestic and international arbitration regimes based on the

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)
^{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)
$^z lnA_i$				0.287	0.253
				(7.376)	(7.438)
$^z lnA_j$				-0.184	-0.148
				(2.534)	(2.525)
$^z lnD_i$				8.678	8.746
				(7.305)	(7.367)
$^z lnD_j$				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)

magnitudes of the estimates on the main variables from ^{z} to ^{z}lnD

Table 9: Robustness check with ^{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)
^{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)
$^{z}lnA_i$				0.559	0.536
				(7.164)	(7.231)
$^{z}lnA_j$				-0.292	-0.256
				(2.592)	(2.584)
$^{z}lnD_i$				8.168	8.226
				(6.851)	(6.923)
$^{z}lnD_j$				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 signi ca.9701 Tf .3m 36 Td [(signi ca.lE 7.9701 Tf 124.033 71.85 Td [(Notes)]TJ/ f .3m 36 Td [(signi eels [(sig6(416sig1%16)-4(0.1ust

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
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

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

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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 gure, this case is more likely to occur when the level of A_i is low.

Without loss of generality, let us consider country j

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. Speci cally, the operating pro ts 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 xed 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 e ect of altering n_j.

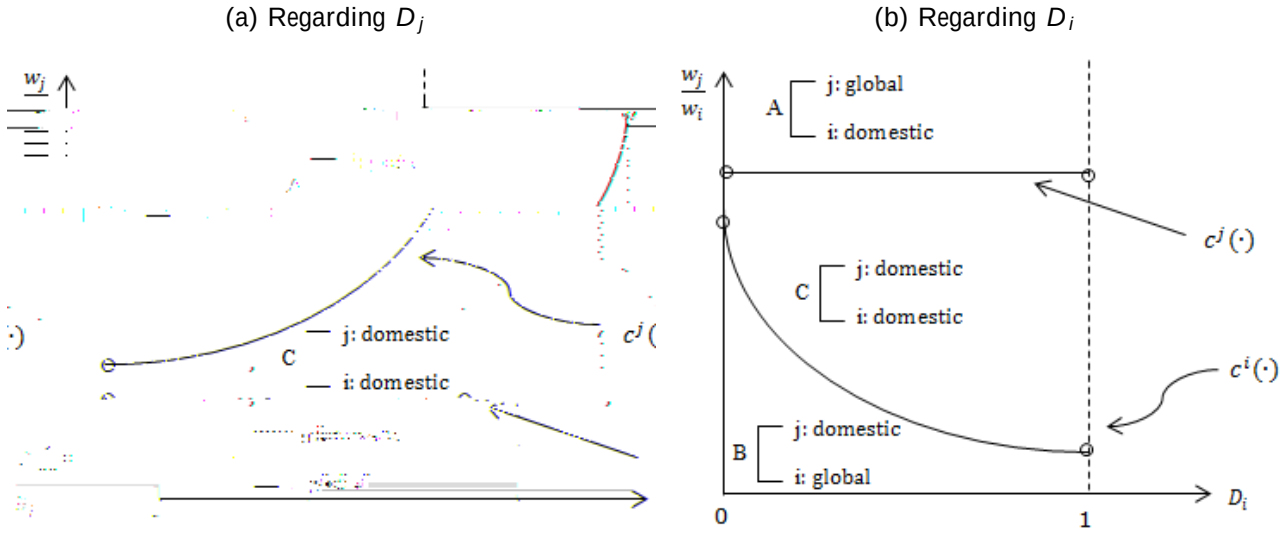
The ratios of the total trade ows for the intermediate input and nal good and the ratios of the total sales and welfare are calculated using the same methodologies described in Section 4.1.2. Then, $\frac{M_{jj}}{M_{ii}}$; $\frac{Y_{ij}}{Y_{ii}}$; $\frac{Y_j}{Y_i}$, and $\frac{U_j}{U_i}$ are all simpli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

w

Thus, in the case where the FGPs in.

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- gure (a) in Figure B.1, the cuto function for j's FGP, $c^j(\,)$, 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 cuto function of $c^j(\,)$, represented by region A, the FGPs of j and i choose global and domestic sourcing, respectively. The cuto function for i's FGP, $c^i(\,)$, is the horizontal line over D_j since D_j does not a ect the choice of i's FGP between domestic and global sourcing. When the wage ratio is low enough so that it is below $c^i(\,)$, 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 cuto functions, all FGPs choose domestic sourcing. Note that the cuto function of $c^j(\,)$ exists above $c^i(\,)$ at each level of D_j. If $c^i(\,)$ is above the minimum value of the wage ratio on the $c^j(\,)$ 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 e ects happen as D_j approaches $c^j(\ )$. That is, as D_j rises given a xed 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 $c^j(\ )$ 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 e ect. This implies that the e ect of D_j on the rms' choices in the neighborhood of $c^j(\ )$ is ambiguous. In the majority of areas in region C, the choices of rms are not ipped. 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 rms tend to choose domestic sourcing through partial and general equilibrium e ects.

Next, consider the choice of sourcing mode with respect to D_i. As shown in sub- gure (b) in Figure B.1, $c^i(\ )$ 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 $c^i(\ )$, i's FGP chooses global sourcing, and j's FGP chooses domestic sourcing. The cuto function for j's FGP, $c^j(\ )$, 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 $c^j(\ )$ 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 cuto curves, domestic sourcing is pervasive. Note that if there is an area, in which $c^j(\ )$ is below $c^i(\ )$, 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

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 speci c 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

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 E ciency 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., speci c agency, o ce 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 ling 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 rst 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 ling 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 rst 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 led?	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 con dence 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 e ort to reach their goals, which can make them cooperate better. Even if a trader pursues opportunism to maximize pro t, 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

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. Speci cally, the human capital index is calculated as $e^{(s_{it})}$, where s_{it} is the average years of schooling for the population aged 15 and older from Barro and Lee (2013). The function (s) was chosen based on Psacharopoulos (1994). The xed 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 Developme((-394u7opme(.e)-383TJ 0 -2t[uree(.e)-383