Culture and Global Sourcing*

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Abstract

This paper develops a pioneering model of global sourcing with culturally dissimilar countries. Production of final goods requires a coordination of decisions between headquarters of a multinational firm and managers of their component suppliers. Managers of both units have strong beliefs about the right course of action and are reluctant to adjust their decisions. Our framework yields a characterization for the optimal allocation of decision rights across firms when contracts are incomplete. In line with a recent empirical evidence, our theoretical model shows that the incentive of a firm to integrate (rather than outsource) its input supply is increasing in a firm's productivity. We further show that the prevalence of foreign integration increases in a geographical distance between the countries and decreases in the cultural distance between managers of the two units. Combining data from the U.S. Census Bureau's Related Party Trade with various cultural measures we find empirical evidence broadly supportive of the latter key prediction.

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1 Introduction

When managers of multinational companies are asked about the challenges of globalization to their businesses, terms like 'cultural differences' or 'intercultural communication' are some of the most frequently given answers. For instance, a global survey of 572 executives conducted by the Economist Intelligence Unit (2012) reports 'differences in cultural traditions' to be the greatest obstacle to productive cross-border collaboration. Not surprisingly, courses on Intercultural Communication became indispensable components of most (if not all) business programs around the world and the impact of cultural distance is widely explored in the business literature. Yet, the effect of culture remains largely understudied in International Economics, both from a theoretical and an empirical perspective.[1] This paper aims at reducing the gap between practitioners' pertinent issue and economists' understanding of this matter by suggesting a pioneering theory of global sourcing with culturally dissimilar countries and bringing this theory to the data.

To be clear, we define culture as the set of values and beliefs people have about how the world works as well as the norms of behavior derived from that set of values. With this definition at hand, culture is generally expected to explain some variation in economic behavior and heterogeneity in aggregate outcomes across nations. Yet, the effect of culture might come particularly strongly to fore when economic agents with different cultural backgrounds come to contact with each other. In this paper, we investigate how national cultural distance, defined as the extent to which the shared values and norms in one country differ from those in another, affects a multinational firm's make-or-buy decision.

The reason for choosing a multinational firm as an object and its ownership structure as a subject of our investigation is threefold. First, multinational firms play a major role in a global economy. According to UNCTAD (2011) World Investment Report, multinational enterprises account for one-quarter of world GDP. Roughly one-third of world trade is intra-firm trade, whereby about another third of the volume of world trade is accounted for by transactions in which multinational firms are one of the two sides of the exchange, cf. UNCTAD (2000).[2] Second, given that a multinational firm is an enterprise which "controls and manages production establishments (plants) located in at least two countries" (cf. Caves 2007: 1), managers of multinational firms are necessarily confronted with the issue of cross-cultural communication. Thirdly, starting with the seminal contributions of Antràs (2003)

[1] See, however, the literature overview further below for some recent contributions on this topic.

[2] In case of the U.S., the role of multinationals is even more significant. Roughly 90 percent of U.S. exports and imports flow through multinational firms, whereby nearly one-half of U.S. imports are transacted within the boundaries of multinational firms rather than across unaffiliated parties, cf. Antràs and Yeaple (2014)

and Antràs and Helpman (2004, 2008), the make-or-buy decision of multinational firms has became one of the most studied topics in International Economics. Yet, to the best of our knowledge, the cultural aspect of this decision has not been considered in the literature.

To address our research question, we need a theory of a multinational firm's boundaries that can accommodate cultural differences across managers. A novel theory by Hart and Holmstrom (2010) seems to be most suitable for our purposes. This approach moves the focus away from the canonical Property-Rights Theory of the firm by Grossman and Hart (1986) and Hart and Moore (1900) – which emphasizes the role of non-human assets in determining a firm's boundaries – towards a theory that highlights the role of managers in making strategic coordination decisions across firm units. A key novel feature of their approach is the assumption that managers enjoy two kinds of benefits: monetary profits and private non-monetary benefits (or job satisfaction). While authors consider the latter benefits as exogenous parameters, we endogenize job satisfaction in our model and assume it to be, among other things, a function of the cultural distance between cooperating partners.[3]

We use this novel organizational foundation to develop a theoretical model of global sourcing that features firm heterogeneity along the lines of Melitz (2003) and country heterogeneity with regard to their national culture values. Production of final goods requires a cooperation of two units: headquarters and manufacturing suppliers, which provide headquarter services and manufacturing components, respectively. Each unit is lead by a single manager, who is in charge of coordinating strategic decisions (e.g., technological standards or the degree of relationship-specifity of inputs) across units.[4] Following Hart and Holmstrom (2010), we assume that managers of both units have strong beliefs about the right course of action and these beliefs differ. Hence, from a managerial perspective, a coordination of decisions across units is associated with a fundamental trade-off. On the one hand, better coordination implies a higher quality of final goods and greater managerial profits. On the other one, deviation from one's most preferred vision and convergence towards the decision of the cooperation partner reduces a manager's non-monetary job satisfaction.

As in Hart and Holmstrom (2010), this decision-making process crucially depends on a firm's organizational form. If the two units are not integrated, each unit's manager makes strategic decisions solely in his own unit. Under integration, a supplier manager becomes a subordinate of the headquarter unit and has to follow the latter's instructions. However,

[3] Both business literature and press reports are rife with anecdotes about the challenges encountered by managers working in foreign culture environments. Several recent empirical contributions have tried to quantify this anecdotal evidence by establishing a negative link between cultural distance and job satisfaction of expatriates, cf., e.g., Froese and Peltokorpi (2011, 2012).

[4] As an example of a strategic decision, Hart and Holmstrom (2010) provide a case study of Cisco and StrataCom, whose managers had to agree on employment of one of the following two technological standards: Internetwork Operating System (IOS) and Asynchronous Transfer Mode (ATM).

to the extent the enacted decision deviates from a supplier manager's most preferred vision, he experiences a loss in non-monetary job satisfaction. We follow Hart and Holmstrom (2010) by assuming that an aggrieved subordinate-manager may 'transfer the hurt back' by reducing a supervisor's job satisfaction. From the viewpoint of a headquarter manager, the make-or-buy decision is thus associated with a simple trade-off: Integration leads to a better coordination of decisions across units and higher monetary profits at the expense of non-monetary cost of enacting decisions in a supplier unit.

What is the role of culture in our model? In any given foreign location, a headquarter manager chooses whether to source components from an independent or integrated supplier by internalizing the effect of cross-cultural communication on his private non-monetary benefits. Our theoretical framework delivers the following key result: Component suppliers are more likely to be integrated into firm boundaries the smaller their cultural distance to the headquarters. Intuitively, as cultural distance increases, it becomes increasingly hard for a manager of an integrated firm to enact his most preferred decisions in a supplier unit. If the associated loss in non-monetary job satisfaction overcompensates a monetary benefit of integration stemming from better coordination of decisions, a headquarter manager may decide to cooperate with a supplier at arm's length.

Apart from the above mentioned key finding, our theoretical model delivers several empirically testable results. First, we show that better coordination of strategic decisions under integration gets reflected in a higher quality of final goods as compared to outsourcing. Second, managers of multinational firms are more likely to integrate their suppliers into firm boundaries rather than cooperating with them at arm's length the higher a firm's productivity. The intuition behind this result lies in the *supermodularity* of profits in productivity and final goods quality. Since higher productivity allows firms to reap higher profits, headquarter managers get a greater incentive to increase the quality of final goods by integrating their suppliers into firm boundaries. Third, a foreign supplier is less likely to be integrated into firm boundaries the higher geographical distance between the two countries. This result is driven by a *submodularity* of profits in variable cost and final goods quality. Intuitively, higher geographical distance increases trade cost, decreases operating profit and, thereby, reduces a marginal gain from a higher final goods quality. As a result, the incentive to improve on goods quality by integrating a supplier into firm boundaries decreases.

Most of our theoretical predictions find a strong empirical support. Using firm-level data, several studies have shown that firms engaging in foreign vertical integration appear to be more productive than firms undertaking foreign outsourcing, see Corcos et al. (2013) for France, Kohler and Smolka (2009) for Spain, and Tomiura (2007) for Japan. Corcos et al.

(2013) also provide supportive evidence for our hypothesis of a negative effect of geographical distance on the relative prevalence of foreign integration vs. outsourcing. Finally, there is a broad consensus in the business literature that integration of an independent supplier into firm boundaries increases the quality of goods or services. The Deloitte (2012) Global Outsourcing and Insourcing Survey reports unsatisfactory quality to be the the major factor in the decision to terminate an existing arm's-length relationship. Moreover, almost all of the firms that switched from outsourcing to insourcing are satisfied with the result in terms of an improved quality.[5] The Deloitte (2012) Global Outsourcing and Insourcing Survey reports that unsatisfactory quality is the single biggest factor in the decision to terminate an existing arm's-length relationship. Furthermore, almost all of the firms that switched from outsourcing to insourcing are satisfied with the result.

Yet, to the best of our knowledge, our key result – the effect of cultural distance on the international make-or-buy decision – has not been empirically analyzed. We bring this prediction to the data by studying the sourcing decisions of U.S. firms. Following Nunn and Trefler (2008, 2012), our key dependent variable is U.S. intra-firm imports as a share of total U.S. imports from the U.S. Census Bureau's Related Party Trade data.[6] Our key independent variable and the associated instrumental variables are drawn from Gorodnichenko and Roland (2011). *To be completed.*

In addition to the work cited above, this paper is related to several branches of the literature. From the theoretical perspective, it is closely related to the extensive and influential literature initiated by Antràs and Helpman (2004, 2008), which studies the international make-or-buy decision through the lens of the Property Rights Theory along the lines of Grossman and Hart (1986) and Hart and Moore (1990).[7] Although the key predictions of this theory find a strong empirical support (cf., e.g., Nunn and Trefler 2008, 2012), some of its underlying assumptions have been strongly criticized in the literature, in particular by the creators of this theory themselves. First, according to Hart (2008) and Hart and Moore (2007, 2008), the importance of noncontractible ex ante investments as sole drivers of organizational form seems to be overplayed. Second, and related, Maskin and Tirole (1999a, b) show that fully rational contracting parties – like the ones imposed by the Property Rights Theory of the firm – can circumvent all ex ante inefficiencies via artful revelation mecha-

[5] There is also a vast anecdotal evidence that suggests a link between make-or-buy decision and quality. For instance, outsourcing of more than 60% of components of Boing 787 Dreamliner to independent producers is considered as one of the major reasons for poor quality and almost four years of delay of the final good, cf., e.g., Tang et al. (2009).

[6] Antràs (2013, 2014) provides a detailed discussion of the suitability of this variable as a proxy for the prevalence of integration.

[7] Antràs (2013, 2014), Antràs and Yeaple (2013), and Antràs and Rossi-Hansberg (2009) provide excellent overviews of this literature.

nisms. As a corollary of this finding, the authors make an argument for a "weaker form of [agents'] rationality", which "unfortunately, our profession has, for the most part, made little progress modeling" (cf. Maskin and Tirole 1999a: 106). Finally, the assumption that cooperating parties will sit down together ex post and bargain to an efficient outcome using side payments seems to be at odds with reality. As Hart and Holmstrom (2010: 484) put it, "many decisions made in a firm will be carried out without consultation or negotiation with other firms even when these decisions impact the other firms in a major way". In order to accommodate for these points of criticism, Hart and Holmstrom (2010) develop a novel theory of the firm that abstracts from the ex ante underinvesment and instead focuses on the decision making process of managers, who weigh their monetary payoffs agains private non-monetary benefits. Employing this novel theory in the international context, we aim at expanding the set of results that are known from the Property Right Theory of a multinational firm along the lines of Antràs and Helpman (2004, 2008).[8]

From the empirical perspective, our paper is related to the burgeoning literature that aims at establishing a causal effect of culture on international trade and foreign direct investment. Using data from the Eurovision Song Context, Felbermayr and Toubal (2010) construct a measure of cultural proximity and show a strong positive effect of this measure on trade volumes. Using historically motivated instrumental variables, Siegel et al. (2011, 2012) show a negative causal effect of egalitarianism distance – defined as the difference in the belief that all people are of equal worth and should be treated equally in society – on foreign direct investment flows, cross-national flows of bond and equity issuances, syndicated loans, and mergers and acquisitions. Guiso et al. (2009) construct a measure of bilateral trust between European countries and instrument it with religious, genetic, and somatic similarities to show that lower bilateral trust leads to less trade and less direct and portfolio investment between two countries. Yet, none of these empirical studies considers the effect of cultural distance on the international make-or-buy decision.

By putting managers in the focus of our analysis, this paper is also related to the empirical literature that studies the impact of a managerial effort on firm and national performance. Several empirical studies have shown a causal effect of successful managerial practices on firm performance.[9] In a recent empirical study, Bloom et al. (2013) also find that cross-country differences in managerial practices may explain a substantial fraction of heterogeneity in total factor productivity across nations. Yet, there is a large consensus in the sociological literature

[8] Several other authors have implemented alternative theories of the firm to the international context, e.g., Grossman and Helpman (2002) use the Transaction Cost Theory à la Williamson (1985) and Marin and Verdier (2009) build on the Delegation approach by Aghion and Tirole (1997). However, these papers do not consider the effect of cultural distance on the international make-or-buy decision.

[9] Bloom and Van Reenen 2010, Gibbons and Roberts 2013, and Syverson 2011 survey this literature.

that managerial behavior itself is a function of a country's cultural values, cf., e.g., Sagiv et al. (2010) for an overview of this literature. We relate these two independent literature strands by showing how cultural differences shape managerial behavior and, thereby, affect both a firm's performance and the attractiveness of countries from the viewpoint of international investors.

The remainder of the paper is structured as follows. Section 2 lays out the basic set up. Section 3 discusses the equilibrium make-or-buy decision and derives theoretical predictions. Section 4 presents econometric evidence supporting this paper's key proposition: a negative relationship between cultural distance and the prevalence of integration. Section 5 concludes.

2 Set-up

Our model economy consists of a home country, N, and many foreign countries, ℓ. All countries have identical consumer preferences. Foreign countries ℓ differ with regard to their geographical and cultural distance to N. Each country is populated by a unit measure of consumers, whereby each consumer is endowed with a unit of inelastically supplied labor. A subset of individuals also possess leadership abilities, which allow them to be employed as managers in existing firms. For simplicity, we assume that each firm is operated by a single manager. There are two types of firms: headquarters and manufacturing suppliers. Headquarters are located in the home country, while manufacturing suppliers are located in foreign countries.

Preferences. Preferences of an individual i in any country are represented by the following quasi-linear utility

$$U_i = z_i + \mu \ln X + \mathbf{1}_{i=H,\,M} \left(j_i^{int} + j_i^{ext} \right), \tag{1}$$

where z_i denotes consumption of a homogenous numéraire-good, X is an index of aggregate consumption of differentiated varieties $v \in V$, and μ is a parameter governing the intensity of preferences for differentiated goods. Aggregate consumption of differentiated varieties is a constant elasticity of substitution function

$$X = \left[\int_{v \in V} q(v)^{\frac{1}{\sigma}} x(v)^{\frac{\sigma-1}{\sigma}} \mathrm{d}v \right]^{\frac{\sigma}{\sigma-1}}, \tag{2}$$

of the consumption a different varieties, $x(v)$, and their quality, $q(v)$, whereby parameter $\sigma > 1$ denotes the elasticity of substitution between any two varieties.

Due to the assumption of non-homothetic preferences, utility turns out to be a linear function of a consumer's income (see below for the derivation). However, we follow Hart and

Holmstrom (2010) by assuming that managers derive their utility not only from the monetary payoff but also from a non-monetary job satisfaction.[10] An indicator function $\mathbf{1}_{i=H,M}$ takes the value one if an individual i is a manager and zero otherwise, whereby H denotes a manager of a headquarter unit and M represents a manager of a supplier firm. In the spirit of Hart and Holmstrom (2010), we further subdivide a non-monetary job satisfaction into two components: intrinsic and extrinsic.[11] The former will be denoted by j_i^{int} and it comes from the pleasure a manager gets from working on the task itself and from the feeling of accomplishment. Extrinsic job satisfaction, j_i^{ext}, stems from the factors bestowed upon an individual by peers (e.g. a friendly working atmosphere, respect of co-workers etc.) and from working conditions. For simplicity, we assume that both components of the non-monetary job-satisfaction enter a manager's utility function in a linear additive way.[12] The functional forms for j_i^{int} and j_i^{ext} will be introduced in the due course. Importantly, in contrast to Hart and Holmstrom (2010), job satisfaction in our model is endogenous.

An individual's budget constraint reads $PX + z_i = Y_i$, where Y_i denotes i's income, $P = \left(\int_{v\in V} p(v)^{1-\sigma} q(v)\mathrm{d}v\right)^{\frac{1}{\sigma-1}}$ is a quality-adjusted price index, and $p(v)$ is a price of a variety $v \in V$. Standard utility maximization yields equilibrium demand functions for the homogeneous good, a bundle of differentiated varieties, and the inverse demand function for each differentiated variety, respectively[13]

$$z_i = Y_i - \mu \quad , \quad X = \mu P^{-1} \quad , \quad p(v) = q(v)^{\frac{1}{\sigma}} x(v)^{-\frac{1}{\sigma}} \mu^{\frac{1}{\sigma}} P^{\frac{\sigma-1}{\sigma}}. \tag{3}$$

Using these results in (1), we obtain an individual's indirect utility (welfare)

$$W_i = Y_i + \mathbf{1}_{i=H,\,M}\left(j_i^{int} + j_i^{ext}\right) - C, \tag{4}$$

whereby $C \equiv \mu \ln P - \mu(\ln \mu - 1)$ summarizes all terms that are constant across individuals.

Production. The traditional good is produced in all countries under constant returns to scale and perfect competition. This numéraire good is assumed to be costlessly traded, implying the same price in all regions. For simplicity, we also normalize the wage rate in all countries to unity.

We assume that final-good varieties are produced and sold only in N. Each variety is

[10] Although we confine our analysis of non-monetary benefits strictly to managers, we believe that our model can be easily extended in order to incorporate employees' job satisfaction as well. We address this issue in the Conclusion.

[11] This conceptualization is widely used in organizational science, cf., e.g., Naumann (1993a), Staw (1989).

[12] This is a standard working assumption in the organizational literature, cf. Naumann (1993b).

[13] We assume sufficiently small preferences for differentiated goods (i.e., $\mu < Y_i$) to ensure positive consumption of the traditional good in equilibrium.

produced by a single firm under increasing returns to scale. To start a production of a variety v, a firm has to bear a fixed cost of entry, consisting of f_E units of local labor. Upon paying these fixed costs, a firm draws a productivity level θ from a known distribution function $G(\varphi)$. After θ is revealed, a firm decides whether to exit the market or start producing. As in Antràs and Helpman (2004), production of final goods requires a cooperation of two units: headquarters and manufacturing suppliers. The former specialize in the provision of headquarter services h, while the latter provide manufacturing components m. These inputs are combined to final goods in N according to the following Cobb-Douglas production function:

$$x(v) = \theta \left(\frac{h(v)}{\eta} \right)^{\eta} \left(\frac{m(v)}{1-\eta} \right)^{(1-\eta)}, \tag{5}$$

where parameter $\eta \in (0,1)$ captures the relative importance of headquarter services in the production process (henceforth, headquarter intensity) and it is assumed to be constant across all firms. To simplify on notation, we drop the variety-index v in the following and identify firms by their productivity θ.

Inputs h and m are produced with a unit labor input requirement each. Shipment of manufacturing inputs from country ℓ to N involves iceberg-type transportation cost τ_ℓ. Given that foreign countries are located at a different distance from N, τ_ℓ differs across locations ℓ. In contrast to Antràs and Helpman (2004), we assume that parties can write enforceable contracts on the quantity and price of the inputs h and m. This alternative assumption is met to eliminate the well-known channel of inefficiencies stemming from ex post hold-up and the associated ex ante underinvestment in relationship-specific inputs (cf. the discussion in the Introduction).

Instead, we suggest a novel channel of inefficiencies that stems from a miscoordination of strategic decisions across units. We extend the model by Antràs and Helpman (2004) by explicitly introducing the final goods quality, q, into the analysis and assuming that this quality crucially depends on the coordination of decisions between H and M. We normalize the set of possible coordination decisions to a unit interval and denote by $\alpha \in [0,1]$ decisions made in the headquarters' unit and by $\beta \in [0,1]$ decisions implemented in the manufacturing firm. As in Hart and Holmstrom (2010), managers H and M have differing visions about the right course of action.[14] More specifically, we assume that these visions are diametrically opposed: H prefers α to be as high as possible, while M prefers β to be as small as possible.[15]

[14] One possible way to justify this assumption is by invoking the issue of relationship-specificity (cf., e.g., Gereffi et al. 2005). In order to set themselves apart from the competitors, final good producers prefer unique production technologies that utilize customized (manufacturing) components. At the same time, component producers usually prefer to keep their production processes as generic as possible, in order to keep the option of supplying other final good producers in case the current cooperation falls apart.

[15] This orthogonality assumption is met merely for analytical simplicity and is qualitatively not crucial

For an efficient production, it does not matter which particular decisions are chosen, as long as these decisions are coordinated between the units. This assumption is formalized by imposing

$$q = 1 - (\alpha - \beta)^2, \tag{6}$$

whereby the quality of a final good is highest ($q^{max} = 1$) for any combination of $\alpha = \beta$ and it is decreasing as α and β diverge.

Given that managers have strong diverging beliefs about the right course of actions, a coordination of decisions across units leads to a reduction in managerial intrinsic job satisfaction. The marginal decrease in intrinsic job satisfaction is highest, the more a manager departs from his most preferred decision ($\alpha = 1$ for H and $\beta = 0$ from M). We choose the simplest possible way to introduce these assumptions into managerial utility function by setting the upper bound of intrinsic job satisfaction to zero and capturing the intrinsic private cost of coordination as follows:

$$j_H^{int} = -(1 - \alpha)^2 \quad , \quad j_M^{int} = -\beta^2. \tag{7}$$

Apart from non-monetary intrinsic cost from cooperation, managerial job satisfaction also includes an extrinsic component, which stems from the factors bestowed upon an individual by peers. Following Hart and Holmstrom (2010), we assume that the ability of a manager to affect the other manager's job satisfaction crucially depends on the ownership structure of a firm. If the two units are not integrated, H choses α in the headquarter unit and M choses β in the manufacturing unit. Given that an arm's-length transaction amounts to a purchase of manufacturing inputs according to ex ante specified conditions, managers have a limited ability to affect each others extrinsic job satisfaction. For simplicity, we normalize both managers' extrinsic job satisfaction under outsourcing to zero. Yet, by integrating a manufacturing supplier into firm boundaries, H obtains residual control rights to make decisions in both units.[16] More specifically, H instructs an integrated M to choose a particular β and the latter must follow these instructions. However, to the extent the decision implemented in a manufacturing unit deviates from M's most preferred decision ($\beta = 0$), M is aggrieved and can transfer the hurt back to the other party.[17] As before, we normalize the upper bound of headquarter manager's extrinsic job satisfaction to zero and

for our results.

[16] Hart and Holmstrom (2010) also discuss an alternative case in which a third (independent) managers administers the integrated firm and managers H and M become her subordinates. Since this case leads to qualitatively similar results, we do not consider it in our model.

[17] A natural question that arises in this context is why M is kept as a subordinate under integration despite the extrinsic private cost of instructing this manager. This assumption can be justified by referring to M's intangible capital or specific know-how of governing the manufacturing unit.

capture H's extrinsic private cost under integration as follows:

$$j_H^{ext} = -c^\ell \beta^2, \tag{8}$$

whereby the parameter $c^\ell \in [0, 1)$ represents a cultural distance between a headquarter manager and a supplier manager in country ℓ. Intuitively, the larger a cultural distance between the two managers, the higher H's private cost of instructing M to take any $\beta > 0$.

In contrast to Antràs and Helpman (2004), contracting parties in our model agree ex ante on the future division of surplus.[18] Under outsourcing, the operating profit is shared between two units according to the following rule: a share $S \in (0, 1)$ is obtained by a headquarter unit, whereas the remaining share $(1 - S)$ accrues to the supplier unit. Furthermore, each firm stipulates a fraction $s \in (0, 1)$ of its operating profit as a managerial compensation. In contrast, under integration, a headquarter unit diverts the entire operating profit and a manager of the integrated firm obtains a fraction $s \in (0, 1)$ of it. As will be shown further below, a manager of an integrated firm obtains in equilibrium a higher monetary compensation than a headquarter manager under outsourcing. This discrepancy can be rationalized by the fact that the scope of work or the amount of time spent managing two units is higher. We will denote by g^ℓ the governance cost a headquarter manager incurs by integration of a supplier unit in country ℓ.

The timing of the game is as follows:

t_0 Headquarters in N incur fixed cost of entry and draw productivities θ. After observing its productivity, a headquarter firm decides whether to leave the industry or to start a production. In the latter case, it matches with a foreign supplier firm and the two units agree on the future division of surplus.

t_1 Each unit hires a single manager and stipulates a fraction $s \in (0, 1)$ of a unit's profit as a managerial compensation.

t_2 H chooses organizational form $k = I, O$, whereby I denotes Integration and O represents Outsourcing.

t_3 If $k = O$, H chooses α and M chooses β. If $k = O$, H chooses α and β.

t_4 H stipulates the quantity of inputs h and m. Inputs are produced and combined to final goods according to production technology from (5).

[18] In view of the fact that most, if not all, real-world commercial contracts include (some kind of) specification for future compensation, the assumption of the current model seems to be more realistic.

t_5 The resulting output is sold and the revenue is distributed between parties according to the sharing rules specified in t_0 and t_1.

The following sections solve this game through backward induction.

3 Equilibrium

The revenue from the sale of the final goods is $R = px$, which, using (3), (5), and (6) can be written as

$$R = \left(1 - (\alpha - \beta)^2\right)^{\frac{1}{\sigma}} \left(\theta \left(\frac{h}{\eta}\right)^{\eta} \left(\frac{m}{1-\eta}\right)^{(1-\eta)}\right)^{\frac{\sigma-1}{\sigma}} \mu^{\frac{1}{\sigma}} P^{\frac{\sigma-1}{\sigma}}. \tag{9}$$

The associated joint operating profit reads:

$$\Pi^{\ell} = R - h - \tau^{\ell} m, \tag{10}$$

Consider first the case of outsourcing. In t_5, this operating profit is divided between two firms according to the sharing rules specified in t_0 and t_1, i.e. headquarters unit receives $S\Pi^{\ell}$, manufacturing unit obtains $(1-S)\Pi^{\ell}$ and each unit's manager obtains a fraction s of a unit's profit. Anticipating this outcome, H chooses in t_4 the quantity of inputs $\{h, m\}$ that maximize her welfare $W_H = sS\left[R - h - \tau^{\ell} m\right] + j_H^{int} - C$, where R is given by (9).[19] This maximization problem yields equilibrium input quantities $h = \eta \frac{\sigma-1}{\sigma} R$ and $m = (1-\eta)\frac{\sigma-1}{\sigma}\frac{R}{\tau^{\ell}}$. Plugging these quantities back in (10) yields joint operating profit for any tuple $\{\alpha, \beta\}$:

$$\Pi^{\ell} = \left(1 - (\alpha - \beta)^2\right) \Theta B^{\ell}, \tag{11}$$

where $\Theta \equiv \theta^{\sigma-1}$ is defined for notational simplicity and $B^{\ell} \equiv (\tau^{\ell})^{-(1-\eta)(\sigma-1)} \frac{\mu}{\sigma} \left(\frac{\sigma-1}{\sigma}\right)^{\sigma-1} P^{\sigma-1}$ summarizes all terms that are constant across firms which source m from a given location ℓ.

Managers anticipate this profit and choose in t_3 coordination decisions that maximize their welfare. More specifically, H maximizes $W_H^{O\ell}$ through the choice of α:

$$\max_{\alpha} W_H^{O\ell} = sS(1 - (\alpha - \beta)^2)\Theta B^{\ell} - (1-\alpha)^2 - C, \tag{12}$$

while M maximizes $W_M^{O\ell}$ through the choice of β:

$$\max_{\beta} W_M^{O\ell} = s(1-S)(1 - (\alpha - \beta)^2)\Theta B^{\ell} - \beta^2 - C. \tag{13}$$

[19] Recall that coordination decisions α and β are made at this point and j_H^{int} and j_M^{ext} do not enter this maximization problem.

Manipulating the first-order conditions, we obtain equilibrium coordination decisions under outsourcing to ℓ:

$$\alpha_O^\ell = \frac{s(1-S)\Theta B^\ell + 1}{s\Theta B^\ell + 1} \quad , \quad \beta_O^\ell = \frac{s(1-S)\Theta B^\ell}{s\Theta B^\ell + 1}. \tag{14}$$

It can be immediately seen from (14) that $\alpha_O^\ell > \beta_O^\ell$, i.e., strategic decisions are not perfectly coordinated across units. As a result, the quality of final goods under outsourcing

$$q_O^\ell = \frac{s\Theta B^\ell(s\Theta B^\ell + 2)}{(s\Theta B^\ell + 1)^2} \tag{15}$$

is below its maximum level for all possible parameter values, i.e. $q_O^\ell < 1$.[20] Plugging (14) in (12), we obtain H's welfare under outsourcing:

$$W_H^{O\ell} = \frac{S(s\Theta B^\ell)^2(s\Theta B^\ell + 2 - S)}{(s\Theta B^\ell + 1)^2} - C. \tag{16}$$

Consider next the case of integration. In t_4, a manager of an integrated firm maximizes his welfare $W_H = s\left[R - h - \tau^\ell m\right] + j_H^{int} + j_H^{ext} - C$ choosing the equilibrium input quantities $h = \eta^{\frac{\sigma-1}{\sigma}} R$ and $m = (1-\eta)^{\frac{\sigma-1}{\sigma}} \frac{R}{\tau^\ell}$. As before, the resulting joint operating profit, $\Pi^\ell = (1 - (\alpha - \beta)^2)\,\Theta B^\ell$ is a function of equilibrium decisions $\{\alpha, \beta\}$. Yet, in contrast to outsourcing, a manager of an integrated firm has the right to choose strategic decisions in both units. Bearing in mind extrinsic private cost from instructing M, cf. (8), H's maximization problem reads:

$$\max_{\alpha,\beta} W_H^{I\ell} = s(1 - (\alpha - \beta)^2)\Theta B^\ell - (1-\alpha)^2 - c^\ell \beta^2 - C \tag{17}$$

Manipulating the two first-order conditions, we get equilibrium decisions under integration:

$$\alpha_I^\ell = \frac{s\Theta B^\ell + c^\ell}{s\Theta B^\ell(1 + c^\ell) + c^\ell} \quad , \quad \beta_I^\ell = \frac{s\Theta B^\ell}{s\Theta B^\ell(1 + c^\ell) + c^\ell}. \tag{18}$$

It can be immediately seen that $\alpha_I^\ell \neq \beta_I^\ell$. That is, despite H's decision rights, strategic decisions under integration are not perfectly coordinated across units. Intuitively, H internalizes the loss in job satisfaction from instructing M and settles for an incomplete coordination, $\beta_I^\ell < \alpha_I^\ell$.[21] As a result, the quality of final goods under integration

$$q_I^\ell = \frac{s\Theta B^\ell(1 + c^\ell)(s\Theta B^\ell(1 + c^\ell) + 2c^\ell)}{(s\Theta B^\ell(1 + c^\ell) + c^\ell)^2} \tag{19}$$

[20] This follows immediately from the fact that $\frac{\partial q_O^\ell}{\partial (s\Theta B^\ell)} = \frac{2}{(s\Theta B^\ell + 1)^3} > 0$ and $\lim_{(s\Theta B^\ell)\to\infty} q_O^\ell = 1$.

[21] Furthermore, relationships $\alpha_I^\ell \gtrless \alpha_O^\ell$ and $\beta_I^\ell \gtrless \beta_O^\ell$ cannot be assigned without ambiguity for all parameter values. In other words, by integrating M, H does not necessarily shift strategic decisions in both units towards his most preferred outcome ($\alpha_I^\ell = \beta_I^\ell = 1$).

is as well below the maximum level, $q_I^\ell < 1$.[22] However, a simple comparison of (19) and (15) yields

Proposition 1. The final goods quality under integration is higher than under outsourcing.

Proof. Follows from the fact that $q_I^\ell - q_O^\ell = \frac{s\Theta B^\ell(s\Theta B^\ell(1+2c^\ell)+2c^\ell)}{(s\Theta B^\ell(1+c^\ell)+c^\ell)^2(s\Theta B^\ell+1)^2} > 0$.

Intuitively, the authority to make decisions in both units under integration allows H to achieve better coordination compared to an arm's length relationship and, thereby, improve on the final goods quality. Using (18) in (17), we obtain H's welfare under integration:

$$W_H^{I\ell} = \frac{(s\Theta B^\ell)^2(1+c^\ell)}{s\Theta B^\ell(1+c^\ell)+c^\ell} - C. \tag{20}$$

In t_2, a headquarter manager anticipates this welfare and contrasts it with $W_H^{O\ell}$ in order to solve the make-or-buy decision. H decides in favor of integration if and only if a welfare benefit of integration $\Omega^\ell(\Theta, c^\ell) \equiv W_H^{I\ell} - W_H^{O\ell}$ overcompensates additional governance cost, g^ℓ, associated with it. Using (16) and (20), the condition for integration reads:

$$\Omega^\ell(\Theta, c^\ell) \equiv \frac{(s\Theta B^\ell)^2(1+c^\ell)}{s\Theta B^\ell(1+c^\ell)+c^\ell} - \frac{S(s\Theta B^\ell)^2(s\Theta B^\ell+2-S)}{(s\Theta B^\ell+1)^2} > g^\ell. \tag{21}$$

It can be immediately seen that $\Omega^\ell|_{\Theta=0} = 0 < g^\ell$. That is, managers of headquarter firms with lowest productivity strictly prefer outsourcing towards integration. It can be also shown that $\lim_{\Theta\to\infty} \Omega^\ell = \infty$, i.e., firms with highest productivity strictly prefer integration towards outsourcing. Lastly, we prove in Appendix A that $\Omega^\ell(\Theta, c^\ell)$ is increasing in Θ. As long as g^ℓ is finite and Θ has positive support over $(0, \infty)$, we thus have

Proposition 2. There exits a unique productivity cutoff $\hat{\Theta}$ such that final good producers with productivities below $\hat{\Theta}$ engage in outsourcing, while those with productivities above this cutoff integrate their suppliers into firm boundaries.

Proof. See Appendix A.

The intuition behind this Proposition lies in the fact that profits are supermodular in productivity and final goods quality, cf. (11). That is, an improvement of final goods quality leads to a largest increase in profits the higher a firm's productivity. Since rewards of headquarter managers are functions of their firm's profits, managers of more productive firms have the greatest incentive to increase the quality of final goods by integrating manufacturing suppliers into firm boundaries.

Furthermore, we show in Appendix A that B^ℓ is decreasing in τ^ℓ. This implies

[22] This follows immediately from the fact that $\frac{\partial q_I^\ell}{\partial(s\Theta B^\ell)} = \frac{2(1+c^\ell)(c^\ell)^2}{(s\Theta B^\ell(1+c^\ell)+1)^3} > 0$ and $\lim_{(s\Theta B^\ell)\to\infty} q_I^\ell = 1$.

Proposition 3. Final good producers are less likely to integrate their foreign suppliers into firm boundaries instead of cooperating with them at arm's-length the higher geographical distance between the two countries.

Proof. See Appendix A.

The intuition behind this result resides in the fact that profits are submodular in transportation cost τ^ℓ and final goods quality, cf. (11). That is, as geographical distance increases, a marginal raise in firm profits due to an improvement of final goods quality decreases. Given that managerial profits are functions of their firm's profits, an incentive of a headquarter manager to increase the quality of final goods by integrating a manufacturing suppliers decreases in the geographical distance to a supplier.

Finally, a simple differentiation of (21) shows that $\Omega(c^\ell, \Theta)$ is decreasing in c^ℓ. This implies

Proposition 4. Final good producers are more likely to integrate their foreign suppliers into firm boundaries instead of cooperating with them at arm's-length the lower cultural distance between the two countries.

Proof. Follows immediately from the fact that $\frac{\partial \Omega^\ell}{\partial c^\ell} = -\frac{(s\Theta B^\ell)^2}{(s\Theta B^\ell(1+c^\ell)+1)^2} < 0$.

To infer the intuition behind this result, recall the tradeoff between integration and outsourcing from the viewpoint of a headquarter manager: Compared to outsourcing, integration leads to a higher monetary payoff but is associated with a loss in extrinsic job satisfaction, cf (8). Given that these cost are increasing in c^ℓ, integration becomes relatively less attractive as cultural distance between the managers of two units increases.

4 Empirical Implementation

To be completed

5 Conclusion

To be completed

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Appendix

A Proof of Propositions 2 and 3

Given that Θ and B^ℓ enter (21) within the expression $\Phi^\ell \equiv s\Theta B^\ell$, it is sufficient to show that Ω^ℓ is increasing in Φ^ℓ in order to prove Propositions 2 and 3. A simple differentiation of Ω^ℓ yields after simplification

$$\frac{\partial \Omega^\ell}{\partial \Phi^\ell} = \frac{(\Phi^\ell(1+c^\ell)+2c^\ell)(1+c^\ell)\Phi^\ell}{\left(\Phi^\ell(1+c^\ell)+c^\ell\right)^2} - \frac{S((\Phi^\ell)^2+3\Phi^\ell+4-2S)\Phi^\ell}{\left(\Phi^\ell+1\right)^3}$$

Since

$$\frac{\partial^2 \Omega^\ell}{\partial \Phi^\ell \partial c^\ell} = -\frac{2c^\ell}{\left(\Phi^\ell(1+c^\ell)+c^\ell\right)^3} < 0,$$

this expression is decreasing in c^ℓ. That is, if $\frac{\partial \Omega^\ell}{\partial \Phi^\ell} > 0$ holds for the highest $c^\ell = 1$, it holds a fortiori for all $c^\ell < 1$. Utilizing $c^\ell = 1$ in the expression above, we have $\frac{\partial \Omega^\ell}{\partial \Phi^\ell} > 0$ if and only if

$$LHS = \frac{2(2\Phi+2)}{\left(2\Phi+1\right)^2} > \frac{S(\Phi^2+3\Phi+4-2S)}{\left(\Phi+1\right)^3} = RHS \tag{22}$$

The right-hand side (RHS) of this inequality is increasing S for all $S \in (0,1)$, as can be seen from

$$\frac{\partial RHS}{\partial S} = \frac{\Phi^2+3\Phi+4(1-S)}{(\Phi+1)^3} > 0.$$

That is, if inequality (22) holds for $S = 1$, it holds a fortiori for all $S < 1$. Substituting $S = 1$ in the right-hand side of inequality (22), we obtain

$$LHS = \frac{2(2\Phi+2)}{\left(2\Phi+1\right)^2} > \frac{\Phi^2+3\Phi+2}{\left(\Phi+1\right)^3} = RHS|_{S=1}$$

Rearranging this inequality, immediately yields

$$LHS - RHS|_{S=1} = \frac{3\Phi^2+5\Phi+2}{\left(2\Phi+1\right)^2\left(\Phi+1\right)^3} > 0 \qquad \square$$