Cultural Distance, Firm Boundaries, and Global Sourcing*

Yuriy Gorodnichenko
UC Berkeley and NBER

Bohdan Kukharskyy
University of Tübingen

Gerard Roland
UC Berkeley, NBER and CEPR

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Abstract

Casual observation suggests that cultural differences play an important role in business transactions, yet systematic evidence on this relationship is scarce. This paper provides a novel empirical investigation of the effect of cultural distance on multinational firms' decisions to integrate their cooperation partners into firm boundaries, rather than transact with independent companies at arm's-length. To guide our empirical analysis, we develop a simple theoretical model which suggests that *(i)* cultural distance between contracting parties decreases the relative attractiveness of integration, and *(ii)* this effect is mitigated in more capital-intensive industries. We test these predictions using extensive product-, industry-, and firm-level data. We find a robust negative effect of cultural distance on the relative attractiveness of integration. In line with our theoretical predictions, we also find that the effect of cultural distance on firm boundaries is less pronounced in more capital-intensive industries.

JEL Classification: F14, F23, L14, L23

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1 Introduction

Whenever managers of multinational companies are asked about the challenges of globalization to their businesses, keywords like 'cultural differences' or 'intercultural communication' are among 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 cooperation have become indispensable components of most business programs around the world and the impact of cultural differences on commercial transactions is widely explored in the business literature. Yet, the effect of cultural differences in international business transactions remains mostly ignored by economists.

To illustrate our point, consider the following two case studies of well-known multinational companies. The Danish toy manufacturer Lego sources its components (bricks) both from a wholly-owned production facility in Czech Republic and an independent supplier in Singapore (Mols, 2010). The state-of-the art answers to the question as to why Lego would integrate its input supply in the former and source it at arm's-length in the latter case include differences in institutions and transportation costs (see Antràs 2015). Yet, to the best of our knowledge, there is no well-established explanation that would relate this case study to the fact that Denmark is culturally closer to Czech Republic than to Singapore, as measured, for instance, by Hofstede's well-known individualism/collectivism index. The second case study deals with the U.S. multinational corporation Coca-Cola, which has more than 250 subsidiaries all over the world. Using firm-level data from the Bureau van Dijk, we identified some of these affiliates and calculated Coca-Cola's average ownership shares in its subsidiaries by country. Coca-Cola owns more than 90 percent of equity stake in its subsidiaries from Great Britain, New Zealand, and Italy, whereas the ownership share in subsidiaries from Japan, Pakistan, and Albania is smaller than 50 percent, on average. Clearly, countries within the two groups widely differ in terms of their institutional environment and economic development. The relevant question, however, is whether the fact that the U.S. is culturally closer to the countries from the first group (as measured, once again, by Hofstede's individualism/collectivism index) might have played a role in Coca-Cola's ownership decisions, beyond institutional or economic differences across countries.

This paper aims to shed light, both theoretically and empirically, on the effects of cultural distance – defined as the extent to which shared values and norms differ across economic agents – on the organization of firms across borders and their global sourcing decisions. More specifically, this paper asks the following research question: Does cultural distance affect a multinational firm's incentives to integrate a business partner into firm boundaries, rather than

transact with an independent supplier at arm's-length? We provide novel empirical evidence for the negative effect of cultural distance on the relative attractiveness of integration across a wide range of econometric specifications and tests. Moreover, we find that the impact of cultural distance varies across sectors, as the negative effect of cultural distance on the integration intensity is mitigated in capital-intensive industries.

To guide our empirical investigation, we develop a simple theoretical model of firm boundaries with cultural frictions. This model describes a business relationship between two parties – a firm's headquarters (HQ) and a manufacturing producer. Production of final goods requires relationship-specific (customized) investments into capital and labor, conducted by the HQ and the manufacturer, respectively.[1] Parties operate in an environment of contractual incompleteness, i.e., courts cannot fully verify and enforce the HQ's investment in capital, nor the manufacturer's investment in labor. Against this backdrop, the relationship between independent parties is plagued by the well-known hold-up problem and the associated underinvestment in both factors of production. Following the Transaction Cost Theory by Williamson (1985), we assume that integration of a manufacturer into firm boundaries eliminates the hold-up inefficiencies at the expense of a governance cost. Furthermore, based on the anecdotal evidence discussed below, we assume this cost to be increasing in cultural differences between the firms' managers. Intuitively, as cultural distance increases, it becomes increasingly strenuous for the HQ's manager to enact the investment decisions in the manufacturing unit and therefore the labor investment decreases as compared to the first-best level. If the associated profit loss outweighs the benefit of integration stemming from the elimination of the hold-up problem and the improved investment in capital, the HQ manager will decide to engage in an arm's-length relation instead. Hence, our model delivers the first key prediction: Cultural distance between firms' managers *ceteris paribus* decreases a HQ's incentive to integrate a business partner into firm boundaries.

While the direct effect of cultural distance on firm boundaries is intuitive, the structure of our theoretical model becomes particularly beneficial when comparing the effect of cultural distance across sectors. More specifically, our second key hypothesis suggests that, for a large and plausible parameter space, the negative effect of cultural distance on the relative attractiveness of integration is mitigated in more capital-intensive industries. What is the intuition behind this interaction effect? Recall from the discussion above that the benefit of integration in our model lies in eliminating the hold-up problem from the viewpoint of the HQ and, thereby, incentivizing the latter's capital investment. Hence, integration is *ceteris paribus* a more preferred organizational form in capital-intensive industries, where the HQ's capital is

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[1] The production side of our model draws on Antràs (2003). However, as will be discussed at length in section 2.1, our framework fundamentally differs in the modeling of the integration decision.

a relatively more important factor of production. It is for this reason that the negative effect of cultural distance on the relative attractiveness of integration is mitigated in capital-intensive industries, where the HQ's investment in capital should be incentivized most.

To the best of our knowledge, neither the direct effect of cultural distance on firm boundaries, nor its interaction with capital intensity, have been empirically analyzed on a systematic basis. This paper provides a novel investigation of these relationships using extensive product/country, industry/country, and firm-pair data. We approximate cultural differences across countries and firm managers using well-known indices developed by Hofstede (2001). Our baseline measure of cultural distance exploits the individualism vs. collectivism cleavage, capturing the extent to which individuals derive value from having an independent self as opposed to being strongly integrated and loyal to a cohesive group.[2]

We bring this prediction to the data in a three-pronged approach, where each subsequent step complements the previous one and advances in the degree of rigor. In the first step, we exploit highly disaggregated U.S. product-level import data by origin country from the U.S. Census Bureau's Related Party Trade dataset. To measure the degree to which U.S. companies integrate their foreign suppliers into firm boundaries, we exploit information on the share of intra-firm imports in total imports. The idea behind this approach is that a high intra-firm import share reflects a greater willingness of U.S. firms to obtain an ownership or control stake in foreign suppliers instead of buying intermediate goods at arm's-length. Controlling for product fixed effects, a standard set of gravity variables, and a range of country-specific factors, we find a negative and significant relationship between a country's cultural distance to the U.S. and the share of intra-firm imports in total U.S. imports from this country. That is, in line with our first theoretical hypothesis, U.S. firms tend to source products from culturally proximate suppliers and import them at arm's-length from culturally distant countries.

In the second step, we exploit variation in ethnic composition of managers across U.S. industries to construct an industry/country-specific measure of cultural distance. More specifically, we use the 2000 U.S. Census data to calculate for each industry the shares of managers with a given cultural background and then use these weights to compute industry/country-specific cultural scores. Hence, in contrast to our product-level regressions where cultural variables vary only across countries, the measure of cultural distance in the second set of regressions varies across countries *and* industries. This approach allows us to introduce country fixed effects, alongside with industry fixed effects. The former fixed effects effectively control for a number of possible omitted variables that may drive the international make-or-buy deci-

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[2]   This cleavage is generally considered to be the main dimension of cultural variation (see Heine, 2008). Moreover, Gorodnichenko and Roland (2011, 2017) find that, among a wide range of cultural scores, the individualism-collectivism dimension matters most for long-run growth. We verify, however, that our empirical results are robust to using distance measures based on the other four cultural proxies by Hofstede, as well as exploiting alternative cultural dimensions from Schwartz (2006) and the World Values Survey.

sion, including the quality of a foreign country's institutions or its economic development. We find that the negative effect of cultural distance on intra-firm import shares continues to be economically and statistically significant even after introducing a large set of fixed effects and industry/country-specific controls, which is consistent with our first theoretical hypothesis. Moreover, in line with our second key hypothesis, we find that the negative effect of cultural distance on intra-firm imports is mitigated in capital-intensive industries.

In the third step, we zoom even further into the link between cultural distance and the integration decision using firm-pair data from the Orbis database of Bureau van Dijk (BvD). This database is uniquely suitable for the purpose of our study by combining the following three features. First, it provides information on ownership shares of headquarters in their subsidiaries worldwide, which we use as our outcome variable. Second, it contains unique information on the nationality of top managers employed by both sides of the ownership link, which is used to construct a firm-pair specific measure of cultural distance. Third, since we observe in which countries HQs and their subsidiaries are located and which industries they are active in, we can effectively control for cross-country differences in the institutional environment or economic development, as well as industry characteristics (such as technological factors, relationship-specificity, contractibility, etc.), using HQ and subsidiary country and industry fixed effects, respectively. Moreover, given that headquarters may have multiple subsidiaries located in many countries, we account for unobserved heterogeneity across parent firms using HQ firm fixed effects. Controlling for a battery of fixed effects, we find that higher cultural distance between firms' managers decreases a HQ's probability to hold a majority (rather than a minority) ownership share in the subsidiary's company – a pattern consistent with our first theoretical hypothesis. Furthermore, in line with our second testable hypothesis, we find that the negative effect of cultural distance on the HQ's probability to hold a majority ownership share in a given subsidiary is mitigated by the capital intensity of the subsidiary's industry. Overall, our findings provide strong evidence for the role of cultural distance, as well as its interaction with industry-level capital intensity, on firm boundaries.

From the theoretical perspective, our model is related to the seminal contribution by Hart and Holmström (2010). The authors put forward a theory of the firm which stresses the role of non-monetary factors such as managerial job satisfaction on firm boundaries. Their model suggests that, by integrating a business partner into firm boundaries, one can achieve better coordination of decisions across firm units, but the integrating firm's manager will experience a loss in job satisfaction due to disputes with the integrated firm's manager regarding the right course of action. The authors conclude that "cultural compatibility and fit of an acquisition partner may be of first-order importance [for firm boundaries]", see Hart and Holmström (2010, p. 510). Our theoretical model corroborates this claim by showing that cultural distance

between firms' managers decreases the relative attractiveness of integration.

The logic behind our first hypothesis can be illustrated using a failed merger between a German multinational company Daimler-Benz and the U.S. car manufacturer Chrysler. The merger of the two companies was intended to create economies of scale by combining Daimler's capital and engineering know-how with Chrysler's manufacturing of parts. Yet, this cooperation was overshadowed with well-documented cultural frictions between German and American managers, which can be easily understood in terms of Hofstede's cultural dimensions.[3]

The fact that German managers are on average less individualistic than the U.S. ones may explain why the former did not approve of the generous pay packages awarded to their U.S. colleagues. German managers were also more formal and hierarchical, respecting rigid rules of decision-making, whereas their American colleagues favored the breaking down of hierarchical barriers, the promotion of cross-functional teams and a relaxed atmosphere in meetings. Higher uncertainty avoidance in German culture explains why Daimler managers were more risk averse and less open to new ideas, whereas Chrysler managers constantly favored experimentation. In principle, the merger was supposed to be a merger of equals but Daimler managers insisted rigidly on doing everything their way, and were quite contemptuous of the American methods of running organizations. This resulted in a series of managerial conflicts and subsequent disintegration (see Cohen and St. Jean, 2004). Interestingly, Daimler still sources some component parts from Chrysler, confirming our hypothesis that arm's-length relationship is a better solution when cultural differences create too many frictions within the firm.

From the empirical perspective, our paper relates to the burgeoning literature that aims at understanding the role of culture in international transactions. Several contributions report a negative relationship between (various measures of) cultural distance and bilateral trade or foreign direct investment, see, e.g., Felbermayr and Toubal (2010), Guiso et al. (2009), Siegel et al. (2011, 2012). Yet, none of these empirical studies considers the link between cultural distance and firm boundaries. In a recent contribution, Kukharskyy (2016) finds that U.S. intra-firm imports are positively related to the level of managerial long-term orientation in U.S. industries and in foreign countries. Furthermore, a headquarter's ownership share in its foreign subsidiary is positively associated with the long-term orientation of the headquarter's managers. In the current paper, we account for the *level* of managerial long-term orientation via country, industry, and HQ firm fixed effects effects and focus on the role of cultural *distance* between the parties (among other things, with respect to the long-term orientation). Importantly, the HQ firm fixed effects account not only for idiosyncratic managerial characteristics,

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but, more generally, for unobserved heterogeneity across parent firms (e.g., with respect to productivity) that may have an effect on the integration decision. By identifying the effect of cultural distance from variation across subsidiaries *within* a multinational firm allows us to come closer towards gauging the true effect of cultural differences on firm boundaries.

This paper further contributes to a large body of literature investigating the determinants of multinational firm boundaries and global sourcing.[4] This literature has come up with a large number of potential explanatory factors that vary across countries (e.g., institutions or economic development) or industries (such as factor intensity, contractibility, relationship-specificity, down- vs. upstreamness, etc.). Since the empirical contributions by Antràs (2003) and Nunn and Trefler (2008, 2013), the industry-level factor that has received particular attention in this literature is capital intensity. Using U.S. data, the authors find a robust positive relationship between capital intensity and intra-firm imports. This relationship has been further validated using firm-level data from several individual countries, see, e.g., Corcos et al. (2013) for France, and Kohler and Smolka (2015) for Spain. We contribute to this literature by emphasizing the role of capital intensity in mitigating the direct negative effect of cultural distance on the relative attractiveness of integration, while controlling for the immediate effect of capital intensity on firm boundaries via industry fixed effects. Moreover, whereas previous studies have used either U.S. *industry*-level data or firm-level data from *individual* countries, we exploit unique *firm-pair* data on HQ and subsidiaries worldwide.

The remainder of the paper is structured as follows. Section 2 lays out our model and derives the theoretical predictions. Section 3 brings these predictions to the data in a three-pronged approach. Section 4 concludes.

2 Theoretical Framework

2.1 Set-up

The demand and production side of our model draws on Antràs (2003), which we adapt to introduce the notion of cultural frictions. Since the original model is well-known, our exposition is deliberately brief. Consider a game between two parties: a firm's headquarters H and a manufacturing producer M. The two firms can be located either in the same or in different countries. Each firm is operated by one manager, whereby the managers of H and M may differ with respect to their cultural backgrounds.[5] H and M collaborate to produce a differentiated variety of a final good. Under constant elasticity of substitution

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[4]   See Antràs (2013, 2015), Antràs and Rossi-Hansberg (2009), and Antràs and Yeaple (2014) for overviews.
[5]   For clarity, we refer to the HQ manager as 'she' and to the manufacturing producer's manager as 'he'.

(CES) preferences, the demand for a single variety of a differentiated good may be expressed by the following iso-elastic function:

$$x = Ap^{-1/(1-\alpha)},$$

where x and p denote, respectively, quantity and price of final goods, $A > 0$ is a demand shifter, and $\alpha \in (0,1)$ is a parameter related to the elasticity of substitution between any two varieties, $\sigma = 1/(1-\alpha)$. This demand function immediately yields the following revenue:

$$R = x^{\alpha} A^{1-\alpha}. \tag{1}$$

Final goods are produced using the following Cobb-Douglas technology:

$$x = \left(\frac{K}{\beta}\right)^{\beta} \left(\frac{L}{1-\beta}\right)^{1-\beta}, \tag{2}$$

where K and L denote, respectively, the amount of capital and labor employed in production, and $\beta \in (0,1)$ captures the relative importance of capital inputs in the production process (henceforth, capital intensity). Let r and w denote the rental rate of capital and the wage rate, respectively, whereby both factor prices are assumed to be exogenous to the firms. By analogy to Antràs (2003), we impose the following set of assumptions regarding the two inputs. First, labor input costs wL are assumed to be borne by M, while capital expenditures rK are carried out by H.[6]

Second, both inputs are assumed to be relationship-specific, i.e., have to be customized to a given relationship and possess no value for a third party. Third, both inputs are non-contractible, i.e., their characteristics cannot be fully verified and enforced by the courts. For simplicity, we refrain from introducing fixed production costs into the model, as these costs would not qualitatively affect our main results.

Against the backdrop of contractual incompleteness, the only incentive device available ex-ante is the choice of the organizational form. We consider the binary decision between integration (I) and outsourcing (O) in the baseline model and analyze the choice of continuous ownership shares in the extension provided in Appendix A.4. The case of outsourcing is modeled by analogy to Antràs (2003). More specifically, since contractual incompleteness prevents contracting parties from stipulating H's and M's compensation contingent on the provision of inputs K and L, respectively, the parties negotiate the division of surplus ex-

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[6] See Antràs (2003) for an extensive discussion of the evidence suggesting this cost sharing structure. To ensure that H is willing to provide capital to M (rather than letting M to bear the investment into K), one can impose a parameter restriction on the HQ's bargaining power. We discuss this condition in Appendix A.1.

post, i.e., after both investments have been sunk. This negotiation process is modeled as a generalized Nash bargaining, whereby H obtains the fraction $\phi \in (0,1)$ of the ex-post gains from trade and M receives the remaining fraction $(1-\phi)$.[7]

This bargaining process is associated with the well-known hold-up problem, which leads to $ex-ante$ underinvestment in relationship-specific inputs. Intuitively, both parties anticipate that the ex-post bargaining will not provide them with the full marginal revenue created by the respective input and reduce the input provision as compared to the case of complete contracts. Unlike Antràs (2003), we assume that by integrating M into firm boundaries H can eliminate the hold-up inefficiencies that has plagued transactions between independent parties.[8] More precisely, the HQ in our model can enforce the labor investment in the manufacturing unit by fiat, but incurs thereby an exogenous governance cost.

We capture this notion of governance cost by assuming that the marginal cost of labor input provision within firm boundaries is multiplied by a factor $g > 1$. Furthermore, we assert that the governance cost is a function of cultural distance c between the HQ's and the manufacturer's managers, and assume that g is increasing in c, as stated in

ASSUMPTION 1. $g = g(c)$, $\frac{\partial g(c)}{\partial c} > 0$.

The economic intuition behind this assumption is well illustrated by the Daimler-Chrysler case study delineated in the Introduction. By integrating Chrysler into firm boundaries, Daimler obtained the right to make decisions in Chrysler's unit. However, this benefit brought along additional governance costs $(g > 1)$ that were amplified by cultural distance between the firms' managers $(g = g(c), g'(c) > 0)$.[9]

Three brief remarks regarding our approach are in order. First, one might be wondering why cultural frictions are assumed to matter within firm boundaries but not under outsourcing. Given that the latter organizational form is modeled as a non-cooperative game in which the two parties choose independently their investment levels, cultural differences between firms' managers play no role in an arm's-length relationship.[10] However, our results are qualitatively unchanged if one were to introduce cultural frictions under outsourcing, as long as these frictions are lower than under integration. Second, by assuming that cultural distance enters

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[7] Following Antràs (2003), we normalize both parties' outside options under outsourcing to zero.

[8] In so doing, we depart from the Property Rights Theory (PRT) of the firm by Grossman and Hart (1986) and Hart and Moore (1990) and build on Williamson's (1985) Transaction Cost Theory (TCT) instead. To be clear, by relying on the TCT we do not aim to challenge the validity of the PRT, but rather choose the former for analytical convenience, as it allows us to derive our theoretical predictions in a simplest possible manner. We are grateful to an anonymous referee for this helpful suggestion.

[9] To keep our model as simple as possible, we introduce cultural frictions into the model via a single cost parameter. However, our framework can be easily extended with a parsimonious modeling of managerial job satisfaction along the lines of Hart and Holmström (2010), without changing our qualitative predictions.

[10] See Hart and Holmström (2010) for analogous treatment of the case of non-integration without cooperation.

the model as a cost parameter, we do not aim to deny potential positive effects of cultural differences on managerial utility and firm's performance.[11] To keep our model simple, we abstain from modeling these positive effects of cultural distance and interpret $g(c)$ as the *net* costs of cultural frictions in the course of enactment of production decisions under integration. Third, although we assume in the baseline model that governance costs of integration occur solely with respect to labor investments, our model can be easily extended to incorporate the governance cost of capital provision. We present this case in Appendix A.3 and show that our results continue to hold under this alternative scenario.

The timing of the above-mentioned game is as follows. In t_0, the HQ decides whether to integrate a manufacturing producer into firm boundaries or transact with the latter at arm's-length. Following the literature, we assume that an independent M makes a lump-sum transfer to H, which ensures that the entire surplus from the relationship accrues to the HQ.[12] Hence, the final good producer chooses in t_0 the organizational form that maximizes the overall surplus from the relationship. In t_1, the investments in capital and labor are chosen. More specifically, under outsourcing H and M choose independently and non-cooperatively the investments in K and L, respectively. Under integration, the HQ can enact the labor investment L by *fiat*, but incurs thereby exogenous governance costs $g(c)$. In an arm's-length relationship, parties get together in t_3 to negotiate the division of surplus via Nash bargaining, where H obtains the fraction ϕ of the ex-post gains from trade. In t_4, final goods are produced and the revenue is realized. The following section solves this game by backward induction.

2.2 Equilibrium

Before analyzing the trade-off between integration and outsourcing, it is instructive to consider first the hypothetical case of complete contracts. If courts could perfectly verify and enforce the investments into capital and labor, parties would stipulate the amounts of K and L which maximize the joint surplus:

$$\max_{K,L} R - rK - wL. \tag{3}$$

Using equations (1) and (2) therein, this maximization problem yields the first-best optimal values of capital and labor, and the associated revenue:

$$K = \frac{\beta\alpha R}{r} \equiv K^*, \qquad L = \frac{(1-\beta)\alpha R}{w} \equiv L^*, \qquad R = B \equiv R^*, \tag{4}$$

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[11]   For instance, Ottaviano and Perri (2005, 2006) explicitly introduce positive utility from goods or services (such as restaurants, entertainment, etc.) supplied by people of different cultures into an individual's preference structure. Although these factors certainly affect job satisfaction, we believe that they play a minor role for the coordination of investment decisions across firm units, which lies at the center of our analysis.

[12]   This assumption is commonly justified by assuming a competitive fringe of potential suppliers, who overbid each other with respect to the lump-sum transfer to H, such that M's ex-ante profits are driven to zero.

where $B \equiv A\alpha^{\frac{\alpha}{1-\alpha}} r^{-\frac{\beta\alpha}{1-\alpha}} w^{-\frac{(1-\beta)\alpha}{1-\alpha}}$ is a parameter defined for notational simplicity. Plugging expressions from equation (4) into equation (3) yields the total profit under complete contracts:

$$\Pi = (1 - \alpha)B \equiv \Pi^*. \tag{5}$$

Consider now the relevant case of outsourcing (O), described in section 2.1. H's and M's maximization problems in period t_1 are given, respectively, by:

$$\max_K \phi R - rK, \qquad \max_L (1 - \phi)R - wL,$$

where R is given by equation (1). This non-cooperative game yields investments in capital and labor:

$$K = \phi\frac{\beta\alpha R}{r} \equiv K_O, \qquad L = (1 - \phi)\frac{(1 - \beta)\alpha R}{w} \equiv L_O, \tag{6}$$

as a function of revenue, which is obtained from plugging equations (2) and (6) into equation (1) and solving the resulting expression for R:

$$R = \phi^{\frac{\beta\alpha}{1-\alpha}}(1 - \phi)^{\frac{(1-\beta)\alpha}{1-\alpha}} B \equiv R_O. \tag{7}$$

A simple comparison of equations (4) and (6) shows that, for any given level of revenue R, outsourcing is associated with underinvestment in both inputs as compared to the case of complete contracts. Intuitively, each party anticipates the future hold-up by the counterpart and reduces the provision of its input. This leads to a reduction of revenue relatively to the first-best case, as $R_O < R^*$ for all $\alpha, \beta, \phi \in (0, 1)$. As mentioned above, M makes in t_0 an ex-ante a lump-sum transfer T, which exactly equals the manufacturer's ex-post profit, $T_O = (1 - \phi)R_O - wL_O$. The overall profit of H under outsourcing thus reads $\phi R_O - rK_O + T_O$, which, using equations (6) and (7), can be expressed as

$$\Pi = (1 - \alpha[\phi\beta + (1 - \phi)(1 - \beta)])\phi^{\frac{\beta\alpha}{1-\alpha}}(1 - \phi)^{\frac{(1-\beta)\alpha}{1-\alpha}} B \equiv \Pi_O. \tag{8}$$

It is straightforward to verify that the overall profit under outsourcing is smaller than under complete contracts, i.e., $\Pi_O < \Pi^*$ for all $\alpha, \beta, \phi \in (0, 1)$.

Under integration (I), the HQ eliminates the hold-up inefficiencies which plague transactions between independent parties, but faces additional governance costs $g(c) > 1$ of enforcing the labor investments in the manufacturer's unit. The maximization problem under integration thus reads:

$$\max_{K,L} R - rK - g(c)wL. \tag{9}$$

Using equations (2) and (6) therein, we obtain investments in capital and labor:

$$K = \frac{\beta \alpha R}{r} \equiv K_I, \qquad L = \frac{(1-\beta)\alpha R}{g(c)w} \equiv L_I, \tag{10}$$

as a function of revenue:

$$R = g(c)^{-\frac{(1-\beta)\alpha}{1-\alpha}} B \equiv R_I. \tag{11}$$

Plugging expressions from equations (10) and (11) in equation (9), we obtain the overall profit under integration:

$$\Pi = (1-\alpha)g(c)^{-\frac{(1-\beta)\alpha}{1-\alpha}} B \equiv \Pi_I. \tag{12}$$

Several observations result from the comparison of equations (6) and (10). First, for any given level of revenue R, we have $K_I > K_O$. Intuitively, integration eliminates the hold-up problem from the viewpoint of H and improves the latter's incentives to invest into relationship-specific capital.[13] Yet, for a given R, the relationship $L_I \gtrless L_O$ cannot be determined without ambiguity. Intuitively, although the investment in labor is no longer plagued by hold-up inefficiencies, it is still below the first-best level because of the governance cost, $g(c)$. Due to underprovision of capital and labor, the revenue and profit under integration are below the first-best level, i.e., $R_I < R^*$ and $\Pi_I < \Pi^*$. This can be seen immediately from the comparison of equations (4) with (11), and (5) with (12), bearing in mind that $g(c) > 1$.

The HQ prefers integration over outsourcing if and only if $\Pi_I \geq \Pi_O$. To assess the effect of model parameters on the relative attractiveness of integration, we define the ratio $\Theta \equiv \frac{\Pi_I}{\Pi_O}$, where integration dominates outsourcing if $\Theta \geq 1$. Using equations (8) and (12), this ratio is given by:

$$\Theta = \frac{(1-\alpha)g(c)^{-\frac{(1-\beta)\alpha}{1-\alpha}}}{(1-\alpha[\phi\beta + (1-\phi)(1-\beta)])\phi^{\frac{\beta\alpha}{1-\alpha}}(1-\phi)^{\frac{(1-\beta)\alpha}{1-\alpha}}}. \tag{13}$$

It is straightforward to prove that Θ decreases in c, as stated in the following

PROPOSITION 1. *Under Assumption 1, the relative attractiveness of integration versus arm's-length transaction decreases in cultural distance between the firms' managers.*

Proof. Follows from the fact that $\frac{\partial \Theta}{\partial c} = -\frac{(1-\beta)\alpha\Theta}{(1-\alpha)g(c)} \frac{\partial g(c)}{\partial c} < 0 \ \forall \alpha, \beta, \Theta, g(c), \frac{\partial g(c)}{\partial c} > 0$.

The direction of this effect is not too surprising given that the cost of integration is assumed to be increasing in cultural frictions (Assumption 1). It is nevertheless instructive for the

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[13]   Nevertheless, it can be easily verified that H's investment under integration is below the first-best level, i.e., $K_I < K^*$. This inequality results from the fact that capital investment is a function of labor investment and the latter is provided at a sub-optimal level i.e., $L_I < L^*$ due to governance costs.

interpretation of further results to understand the underlying mechanism at work. As cultural distance increases, it becomes increasingly costly for the HQ to enforce by *fiat* the labor investment in the manufacturer's unit and the optimal amount of L_I from equation (10) decreases. The resulting decrease in output and revenue is further aggravated by the underinvestment in capital, as the optimal K_I from equation (10) is reduced due to a decrease in R. Both effects lead to a reduction in the overall profit from integration, Π_I and decrease the relative attractiveness of integration versus outsourcing, Θ.

The model makes it possible to analyze how the effect of cultural distance varies depending on an industry's capital intensity. We prove in Appendix A.2 that, as long as $g(c)$ is below a certain threshold $\bar{g}$, the negative effect of cultural distance on the relative attractiveness of integration is mitigated in capital-intensive industries. The formal condition for this interaction effect to hold is given by

$$g(c) \le e^{\frac{(1-\alpha)(1-\alpha\phi)-(1-\alpha[\phi\beta+(1-\phi)(1-\beta)])\alpha(1-\beta)\ln\left(\frac{1-\phi}{\phi}\right)}{(1-\alpha[\phi\beta+(1-\phi)(1-\beta)])\alpha(1-\beta)}} \equiv \bar{g}, \tag{14}$$

We summarize this result in

PROPOSITION 2. *If $g(c) < \bar{g}$, the negative effect of cultural distance on the relative attractiveness of integration is mitigated by the capital intensity of the subsidiary's industry: $\frac{\partial^2 \Theta}{\partial g(c)\partial \beta} > 0$. If instead $g(c) > \bar{g}$, the effect will be amplified by capital intensity: $\frac{\partial^2 \Theta}{\partial g(c)\partial \beta} < 0$.*
Proof. See Appendix A.2.

As shown in Appendix A.2, condition (14) is satisfied for a wide range of plausible parameter values. What is the intuition behind this interaction effect? Recall from our discussion above that the key benefit of integration lies in improving the HQ's incentives to invest into relationship-specific capital. This investment is particularly valuable in capital-intensive industries, where capital is a relatively more important factor of production. Therefore, the negative effect of cultural distance on the relative attractiveness of integration is less pronounced in capital-intensive industries, where the HQ's investment into capital should be incentivized most.

Given that the direction of the above-mentioned interaction effect is intuitive, one may wonder why it hinges on the parameter restriction from equation (14). To understand what happens when this condition is violated, consider the case of a very large cultural distance, causing an exorbitantly high governance cost and a very small optimal investment into labor, (in the extreme case, L_I close to zero, see equation (10)). Due to standard properties of the Cobb-Douglas production function from equation (2), a marginal increase of L_I in such a situation would have a particularly strong positive effect on integration profits. Yet, an increase in

capital intensity β reduces L_I from equation (10) even further and makes integration particularly non-attractive from the viewpoint of the HQ. Because of this, the mitigating interaction effect of cultural distance and capital intensity on the relative attractiveness of integration holds only if cultural differences are within certain bounds (i.e., $g(c) < \bar{g}$). Appendix A.2 demonstrates that the condition from equation (14) is highly likely to be fulfilled for relevant parameter values.

One may wonder to what extent our theoretical results depend on the fact that the governance cost is associated only to labor investment. What happens if the governance cost also affects the efficiency of capital? If we assume that $g(c)$ affects not only labor investment but also capital investment, the results of propositions 1 and 2 carry through, as we show in Appendix A.3. The mitigating effect of capital intensity on the cultural effect under integration (proposition 2) is even now unambiguous for all possible parameter constellations.

In our analysis so far, we have focused on a binary organizational choice between integration and outsourcing. Yet, in reality, the HQ may choose from a continuum of ownership shares in the manufacturing unit. Since some of our subsequent empirical exercises exploit data on continuous ownership shares, one might wonder whether our predictions extend to the case of a non-binary integration decision. In Appendix A.4, we develop a generalization of our baseline model in which a HQ chooses a continuous ownership share $s \in [0, 1]$ in the manufacturing unit. In line with the logic of our baseline model, we assume that a marginally higher ownership share has the following two effects on firm cooperation. First, the HQ holding a higher ownership share is relatively less exposed towards future hold-up by the manufacturer and contributes a higher capital investment to the relationship. Second, a larger s yields the HQ more voting rights in the managing board of the affiliate, which allows her to enforce a larger fraction of the manufacturer's investment into labor by *fiat*. However, as in the baseline model, we assume that the latter benefit comes at the expense of the governance cost, which is increasing in cultural distance between the managers of the two firms.

We formally prove in Appendix A.4 that Proposition 1 extends to the case of a continuous integration decision. More precisely, we show that the HQ's optimal ownership share in the manufacturing unit decreases in cultural distance between the firms' managers. Intuitively, even though a higher involvement in the managing board of the affiliate permits the HQ to enforce a larger number of investment decisions by *fiat*, it is also associated with additional governance cost, which are monotonically increasing in cultural differences between the firms' managers. Hence, an increase in cultural distance is ceteris paribus associated with a marginal reduction of the HQ's optimal ownership share in the subsidiary's company. Unfortunately, the complexity of the extended framework does not permit an analytically tractable solution of the interaction effect of cultural distance and capital intensity on firm boundaries. However,

we verify numerically that the positive interaction effect derived in Proposition 2 continuous to prevail in this extended model for a wide range of permissible parameter values. This leads us to conclude that the key predictions of the baseline model extend to the case of a continuous integration decision.

3   The Empirical Analysis

In the previous section, we hypothesized that cultural distance decreases the attractiveness of integration vs. arm's-length transaction, and that this effect is mitigated by the capital intensity in the affiliate's industry. To investigate whether these predictions are borne out in the data, we use several datasets that measure cultural distance, the intensity of intra-firm cross-border import flows, ownership structure of firms, and a number of other potential determinants of international make-or-buy decisions. We conduct our analysis in three consecutive steps, employing at each step an increasingly disaggregated measure of cultural distance. We start our analysis using broad country-pair measures of cultural distance. In the second step, we construct a novel measure of cultural distance that varies across countries *and* industries. Finally, we exploit unique firm-level data on managerial nationalities to construct a firm-pair specific measure of cultural distance. To rule out alternative explanations, each econometric model uses an extensive list of controls and a broad spectrum of fixed effects. Across datasets, controls and estimation approaches, we consistently find that cultural distance is associated with decreased incidence of integration vs. arm's-length transactions. Moreover, we also find that the negative effect of cultural distance on the relative attractiveness of integration is mitigated by the capital intensity of the affiliate's industry.

3.1   Cross-country Variation of Cultural Distance

3.1.1   Data and Econometric Specification

We start the empirical analysis with the U.S. Census "Related Party Trade" product-level data collected by the U.S. Bureau of Customs and Border Protection. These data are drawn from Antràs (2015) and contain information on U.S. imports of 5705 products (according to the six-digit Harmonized System classification, HS6) from 232 countries over 2000-2011. For each product category, this dataset not only reports the total value of imports but also indicates the value of imports from related parties.[14] We use the share of related-party imports in total

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[14]   A related-party import is defined by the U.S. Census Bureau as an import transaction involving parties "with various types of relationships including any person directly or indirectly, owning, controlling or holding power to vote, 6 percent of the outstanding voting stock or shares of any organization", whereas non-related imports involves parties that "have no affiliation with each other".

imports as the dependent variable (henceforth intra-firm import share, $IFIS$). Since a higher ratio of intra-firm imports reflects a greater willingness of firms to obtain an ownership or control stake in foreign suppliers, this dataset has been widely used in the literature to study the determinants of a multinational firm's integration vs. outsourcing decisions, see Antràs (2013, 2015).

We start by investigating the direct relationship between cultural distance and intra-firm imports.[15] The baseline specification in this section reads:

$$IFIS_{p\ell t} = \gamma \, Cultural \, distance_{US,\ell} + \boldsymbol{x}\boldsymbol{X}_{US,\ell} + \boldsymbol{z}\boldsymbol{Z}_{\ell(t)} + \phi_p + \phi_t + \varepsilon_{p\ell t}, \qquad (15)$$

where $IFIS$ is the U.S. intra-firm import share, and p, ℓ, and t index products, foreign countries, and years, respectively. Our key explanatory variable $Cultural \, distance_{US,\ell}$ measures cultural distance between the U.S. and country ℓ, with the expected sign of the coefficient $\gamma < 0$. Vector $\boldsymbol{X}_{US,\ell}$ (with the associated coefficient vector $\boldsymbol{x}$) contains standard gravity controls, and vector $\boldsymbol{Z}_{\ell(t)}$ (with the coefficient vector $\boldsymbol{z}$) includes additional controls that vary by country (and year). An important feature of our analysis is the inclusion of product fixed effects, ϕ_p, which account for heterogeneity across goods (e.g., with respect to capital intensity, contractibility, transportability, etc.); ϕ_t denotes year fixed effects, and $\varepsilon_{p\ell t}$ is an error term.

To measure cultural differences across countries, we use indices constructed by Geert Hofstede, initially for about 30 countries in the early 1970s and later extended to cover nearly 100 countries. Hofstede (2001) identified four key dimensions of culture: *(i)* individualism vs. collectivism (the extent to which it is believed that individuals are supposed to take care of themselves as opposed to being strongly integrated and loyal to a cohesive group); *(ii)* uncertainty avoidance (sensitivity to ambiguity and uncertainty); *(iii)* power distance (strength of social hierarchy); *(iv)* and masculinity-femininity (task orientation versus person-orientation). The list of cultural dimensions has been subsequently extended with a fifth measure of long-term orientation, capturing the extent to which individuals are willing to delay immediate gratification in favor of long-term benefits (see Hofstede et al. (2010)). Since the cross-cultural psychology literature views the individualism-collectivism cleavage as the main difference across cultures (see Heine, 2008), our baseline analysis focuses on this cultural dimension.[16] Appendix Figure B.1 in Appendix presents the map of individualism scores. Original scores vary on a scale between 0 and 100, where a higher (lower) score means a higher level of individualism (collectivism). For expositional purposes, we rescale them to a unit interval. Conveniently, the U.S. is the country with the highest individualism score. The

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[15]   We consider the interaction between cultural distance and capital intensity in sections 3.2 and 3.3.
[16]   We provide the robustness checks using other Hofstede's dimensions in section 3.3.

cultural distance of country ℓ to the U.S. is calculated as $Cultural\ distance_{US,\ell} = |I_{US} - I_\ell|$, where I is a country's individualism score.

To ensure that the effect of cultural distance on firm boundaries is not confounded by other country-pair specific factors, we include a vector of bilateral controls, $\boldsymbol{X}_{US,\ell}$. More specifically, we draw from the CEPII database by Mayer and Zignago (2011) the following standard set of control variables used in gravity regressions: $Geographic\ distance_{US,\ell}$ is the log distance between the biggest cities of the two countries; the dummy variable $Common\ border_{US,\ell}$ is set to 1 for pairs of countries that share a border; $Common\ language_{US,\ell}$, $Common\ legal\ origin_{US,\ell}$, and $Colonial\ links_{US,\ell}$ are binary variables equal to 1 if both countries have the same official language, share the same legal origin, or have had a colonial relationship, respectively. One may be worried that the dummy variable $Common\ language_{US,\ell}$ does not sufficiently account for linguistic distance between the countries, see, e.g., Melitz and Toubal (2014). To account for this potential confounding factor, we draw from Spolaore and Wacziarg (2015) an additional distance measure $Linguistic\ distance_{US,\ell}$, which captures the expected linguistic distance between two randomly chosen individuals, one from the U.S. and one from country ℓ. In addition to the above-mentioned standard set of gravity controls, we include a proxy for $Freight\ costs_{US,\ell}$, calculated as the average ratio of Cost Insurance and Freight (CIF) to Free On Board (FOB) import values from a given country. This measure is drawn from Antràs (2015) and it controls for the effect of trade costs on the international make-or-buy decision. Summary statistics for the main estimation sample are provided in Table B.1 in Appendix B.

To further mitigate the omitted variables bias, we include (time-varying) country-level controls $\boldsymbol{Z}_{\ell(t)}$. One may be worried that the structure of trade and cultural attributes is associated with the level of economic development. For example, more developed trading partners may happen to have a closer proximity to the U.S. in terms of culture and, thereby, exhibit a higher prevalence of integration.[17] To rule out this alternative explanation, we include the log of a country's GDP per capita, $\log(GDPpc)_{\ell t}$ from the Penn World Tables (version 8.1), as an additional regressor. To account for the effect of a foreign country's market size on U.S. intra-firm imports, we further control for the log of a country's GDP, $\log(GDP)_{\ell t}$ from the Penn World Tables. Contracting institutions have been shown to be an important explanatory factor of the international make-or-buy decision, see, e.g., Eppinger and Kukharskyy (2017). We draw from the World Bank's Worldwide Governance Indicators the rule of law index, $Rule_\ell$ – a standard measure of the quality of contracting institutions. In the robustness checks, we consider a wide range of alternative institutional proxies from the World

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[17]   We should note, however, that while it is widely known that economic development affects the volume of trade between countries, we are not aware of models linking income per capita to intra-firm trade.

Bank and the International Country Risk Guide (ICRG). Guiso et al. (2006) suggest that the level of trust can influence the volume of trade between countries. To tackle this question, we also control for the country's level of $Trust_\ell$, taken from the World Values Survey.

3.1.2 Results

As a first pass at the data, Figure 1 plots the share of U.S. intra-firm imports aggregated at the country level and averaged over 2000-2011 against the cultural distance between the U.S. and a given country ℓ. The line depicts the fitted linear relationship between the variables, where the top right corner reports results for the fitted line. At this aggregate level, the correlation between these two measures is negative and highly significant. A country such as Pakistan, which exhibits a high cultural distance to the U.S. has less than 10 percent of intra-firm imports from the U.S., whereas a country like Germany that is culturally much closer has approximately 70 percent of imports that are intra-firm.
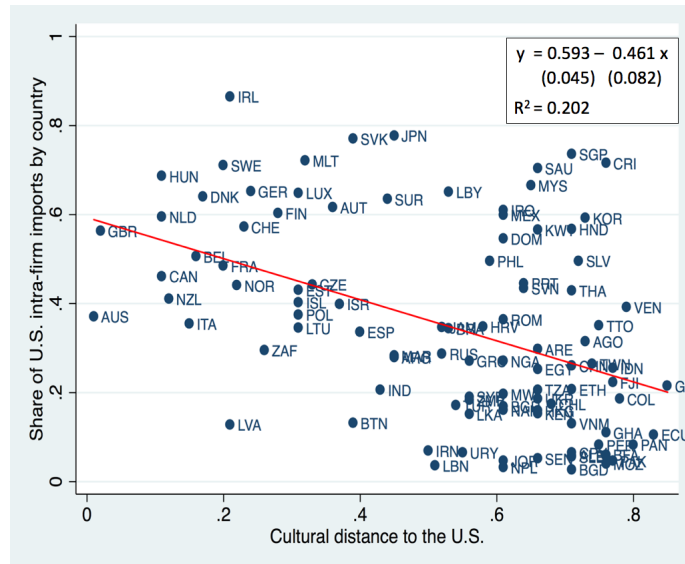
FIGURE 1. *Cultural distance and the share of intra-firm imports by country.*

While this correlation is informative, obviously we need to control for other variables to see if this relation is not driven by omitted variables. Table 1 reports estimates of equation (15). As can be seen from column (1), the effect of cultural distance is negative and highly significant after controlling for product and year fixed effects. The coefficient remains highly significant after the inclusion of a range of gravity variables and controlling for trade cost in columns (2) and (3). Among the alternative distance measures, only linguistic distance is significantly correlated with the share of intra-firm imports, however, the sign of the coefficient is opposite to the one of cultural distance. The coefficient of *Cultural distance*$_{US,\ell}$ remains significant after controlling for a foreign country's economic development and market size in column (4),

as well as institutional quality and trust level in column (5). A standard deviation change in the level of individualism (24.83 points in the individualism index) is associated with a 12.6 percentage point change in the share of intra-firm imports. This is a significant magnitude since the average share of intra-firm imports at the product/country level is 23%.

Table 1. *Determinants of U.S. Intra-firm Import Shares: Cross-country Variation of Cultural Distance.*

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Intra-firm import share, $IFIS_{p\ell t}$					
$Cultural\ distance_{US,\ell}$	-0.212***	-0.233***	-0.170***	-0.178***	-0.138**	-0.128*
	(0.041)	(0.035)	(0.058)	(0.061)	(0.066)	(0.068)
$Geographical\ distance_{US,\ell}$		-0.021	-0.014	0.006	0.002	-0.004
		(0.024)	(0.029)	(0.029)	(0.034)	(0.034)
$Common\ border_{US,\ell}$		0.044	-0.029	-0.030	-0.020	-0.027
		(0.077)	(0.063)	(0.060)	(0.064)	(0.064)
$Common\ language_{US,\ell}$		-0.049*	-0.031	-0.036	-0.048	-0.045
		(0.027)	(0.027)	(0.029)	(0.031)	(0.032)
$Common\ legal\ origin_{US,\ell}$		-0.034	-0.011	-0.017	-0.019	-0.020
		(0.028)	(0.026)	(0.026)	(0.028)	(0.029)
$Linguistic\ distance_{US,\ell}$			0.149***	0.136***	0.128**	0.129**
			(0.049)	(0.050)	(0.053)	(0.053)
$Freight\ costs_{US,\ell}$			-1.610***	-2.204***	-2.133**	-2.474***
			(0.573)	(0.679)	(0.849)	(0.890)
$\log(GDPpc)_{\ell t}$				-0.015	-0.042**	-0.048**
				(0.016)	(0.019)	(0.020)
$\log(GDP)_{\ell t}$				-0.006	-0.002	0.010
				(0.008)	(0.009)	(0.012)
$Rule_{\ell}$					0.043**	0.053**
					(0.021)	(0.022)
$Trust_{\ell}$					-0.035*	-0.034
					(0.020)	(0.021)
$IMR_{\rho\ell t}$						0.048**
						(0.022)
Product FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Observations	1,460,334	1,460,334	1,420,879	1,412,085	1,389,657	1,389,321
R^2	0.151	0.163	0.169	0.169	0.171	0.171

Notes: The table reports OLS estimates of equation (15) with product and year fixed effects. Variables are defined in the text. Robust standard errors are clustered at the country level and presented in parentheses. ***, **, * denote 1, 5, 10 % significance, respectively.

In the analysis so far, we have taken the foreign destination as given and have studied whether cultural distance affects U.S. importers' decisions whether to source a given product from that country within firm boundaries rather than at arm's-length. However, the choice of the foreign production destination may itself be a function of cultural distance. In particular, one could argue that headquarters solve in practice a two-stage decision problem, deciding in the first step whether to source products from a given country or not, and choosing in the second step whether to import these products within firm boundaries or transact with

an independent supplier. To account for the potential selection bias, we apply the selection correction proposed by Heckman (1979). The first-stage selection equation explains a dummy $\Psi_{p\ell}$, which indicates whether or not we observe any imports of product p from a foreign country ℓ in a given year by the following Probit regression:[18]

$$\Pr(\Psi_{p\ell} = 1|\mathbf{K}_{p\ell}) = \Phi\left(\boldsymbol{\kappa}\mathbf{K}_{p\ell}\right), \tag{16}$$

where the vector $\mathbf{K}_{p\ell}$ (with associated coefficient vector $\boldsymbol{\kappa}$) contains product fixed effects ϕ_p, as well as all the country and country-pair specific variables contained, respectively, in vectors $\boldsymbol{Z}_{\ell(t)}$ and $\boldsymbol{X}_{US,\ell}$ from equation (15), see column (5) of Table 1.

We follow Helpman et al. (2008) and use *Religious distance*$_{US,\ell}$ as the selection variable.[19] The idea behind this approach is that religious beliefs may affect a multinational firm's decision to enter a given foreign market but once the entry decision is made, the choice whether to cooperate with a given business partner at arm's-length or within firm boundaries is likely to be independent of religious distance. After we verify that *Religious distance*$_{US,\ell}$ enters negatively and significantly the first-stage (selection) regression (16), we use the estimated specification (16) to compute the inverse Mills ratios ($IMR_{p\ell t}$) which we include in the second-stage equation (15) to correct for potential selection bias, see Wooldridge (2010). Column (6) from Table 1 reports the estimates of equation (15) after sample selection correction. The coefficient of *Cultural distance*$_{US,\ell}$ remains negative, albeit slightly diminished in size and significance (as the p-value is 0.06). We thus conclude that the negative relationship between cultural distance and intra-firm imports is robust to sample selection correction.

We further verify the validity of our results in a range of unreported robustness checks (available upon request). First, we find that the link between *Cultural distance*$_{US,\ell}$ and $IFIS_{p\ell t}$ is negative and significant for single years within 2000-2011. Second, although the use of the OLS model to study the determinants of intra-firm import shares is fairly standard in the literature (see, e.g., Nunn and Trefler 2008, 2013, and Antràs 2015), one might be concerned that this estimation technique does not accommodate well the fact that the dependent variable is a fraction (bounded between zero and one). To account for this concern, we rerun our regressions using generalized linear models – fractional probit and fractional logit (see Papke and Wooldridge (1996)). Lastly, we consider a wide range of additional control variables (e.g., a country's human and physical capital abundance using time-varying proxies from Penn World Tables), and we also experiment with alternative proxies for institutions (using World Bank's

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[18]   As suggested by Wooldridge (2010), we estimate the Probit model for each year t.
[19]   This variable is drawn from Spolaore and Wacziarg (2015) and captures the probability that two randomly selected individuals (one from each country) adhere to different world religions, as categorized by the World Christian Database.

Doing Business database or International Country Risk Guide data). Throughout specifications, the negative coefficients on *Cultural distance*$_{US,\ell}$ remain statistically and economically significant.

While these results are reassuring, they do not eliminate the possibility that there are confounding factors at the level of countries which affect both cultural distance and the international make-or-buy decision (e.g., historical commercial ties). The standard practice to control for (unobserved) heterogeneity across countries is to include country fixed effects. Unfortunately, we cannot implement this approach in the current specification since cultural distance varies only by country. In the following section, we enhance our identification by constructing a novel industry/country measure of cultural distance, which accounts for the heterogeneity of U.S. industries with respect to cultural backgrounds of their managers and also allows for the inclusion of industry and country fixed effects.

3.2 Industry/Country Variation of Cultural Distance

3.2.1 Data and Econometric Specification

As in the previous section, the dependent variable is the share of intra-firm imports in total imports from the U.S. Census Bureau's Related Party Trade database. Yet, instead of using the HS6 product-level data, we now exploit industry-level information, categorized according to the 6-digit North American Industry Classification System (NAICS). This slightly less disaggregated data contains information on intra-firm imports by 390 manufacturing industries from 232 countries over 2000-2011.

Our baseline specification in this section is as follows:

$$IFIS_{i\ell t} = \gamma\,Cultural\ distance_{i\ell} + \delta Cultural\ distance_{i\ell} \times \log(K/L)_i + \phi_{\ell t} + \phi_i + \boldsymbol{\chi}\boldsymbol{X}_{i\ell(t)} + \varepsilon_{i\ell t},\ (17)$$

where $IFIS$ is the U.S. intra-firm import share and i, ℓ and t index industries, countries, and years, respectively. The key feature in this section is that our explanatory variable, *Cultural distance*$_{i\ell}$ now varies across countries *and* industries.[20] This approach allows us to address the above-mentioned concern related to unobserved heterogeneity across foreign destinations using country/year fixed effects, $\phi_{\ell t}$.[21] Moreover, to test our second key hypothesis, we consider the interaction between cultural distance and (the log of) an industry's capital intensity, $\log(K/L)_i$, where the expected sign of the coefficient is $\delta > 0$. To account for industry-specific characteristics that have been identified in the literature as important

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[20]   We omit the subscript "US" to simplify on notation.

[21]   Since the U.S. is the only source country in our analysis, the destination country fixed effects also fully account for time-invariant bilateral factors that might have confounded the relationship in Table 1.

determinants of the international make-or-buy decision (such as capital intensity, contractibility, relationship-specificity, etc.), we include industry fixed effects, ϕ_i. Lastly, we account for factors that vary by industry/country using a vector of (time-varying) industry/country-level controls, $\boldsymbol{X}_{i\ell(t)}$.

To construct a measure of cultural distance between the U.S. and a given country that varies by industry/country, we proceed as follows. We use information on the ancestry of U.S. citizens from the 2000 U.S. Decennial Census to estimate the ethnic composition of managers in U.S. industries. In this census, 80.1 percent of the population reported their ethnic origin, 72 percent of which specified a single ancestry and the remaining 28 percent mentioned two ancestries. For the construction of our measure, we use the first ancestry indicated by an individual. The vast majority of ancestries can be mapped to a distinct country of origin (e.g., Japanese to Japan, or Italian to Italy). A small fraction of individuals who indicated their ancestry in terms of geographical areas (e.g., Western European or African), broad ethnic groups (e.g., Arab or Slav), or no longer existent countries (e.g., Assyrian/Chaldean) were dropped. This leaves us with 94 distinct countries of origin. Since the make-or-buy decision is made by a firm's managers (rather than employees), we restrict our sample to individuals who indicated their occupation as 'Manager'. For the construction of our baseline measures of cultural composition, we further narrow down the sample by considering only those managers who are likely to be in charge of the make-or-buy decision (i.e., 'Chief Executives', occupation code 001 in the 2000 U.S. Census classification) or directly involved in the coordination of decisions across firm units ('Operations Managers', 'Industrial Production Managers', 'Engineering Managers', codes 002, 014, and 030, respectively).[22] In addition to the ethnicity and occupation of a given respondent, the 2000 U.S. Census reports the industry affiliation of the respondent's occupation.[23] We exploit this information to calculate the ethnic shares of managers in a given industry. Finally, we use these shares as weights for the individualism levels of the ancestors's country of origin to obtain U.S. industry-specific individualism scores:

$$I_{i,US} = \sum_{\ell} \lambda_{\ell i} I_{\ell}, \qquad (18)$$

where $\lambda_{\ell i}$ is the share of ethnic group ℓ in industry i. The cultural distance between a country ℓ and the U.S. for industry i is thus given by $Cultural\ distance_{i\ell} = |I_{i,US} - I_{\ell}|$.

We construct three versions of this measure to assess the robustness of our results to alternative treatments of missing values as well as to rule out competing theories of the structure

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[22]   Our results are robust to considering all managerial occupations (including sales managers, public relations managers, etc.), which corresponds to using codes 001 through 041 in the 2000 U.S. Census classification.

[23]   This information is reported according to the NAICS Industry (INDNAICS) classification, which we map to NAICS codes using the crosswalk provided by the U.S. Census.

of trade. First, we consider only those managers who report their ancestry, and define the associated cultural distance as $Cultural\ distance_{i\ell}^{(1)} = |I_{i,US}^{(1)} - I_\ell|$. For the second measure, we assign the average U.S. individualism score to those respondents of the U.S. Census who do not report their ancestry, $I_{i,US}^{(2)} = \sum_\ell \tilde{\lambda}_{\ell i} I_\ell$. We denote the corresponding distance measure as $Cultural\ distance_{i\ell}^{(2)} = |I_{i,US}^{(2)} - I_\ell|$. The third measure is a modification of the first one, tailored to minimize the effects of language ties or network effects within ethnic groups, see Rauch (1999). In particular, we construct a measure of individualism for a given trading partner of the U.S. and a given industry such that this measure considers only ethnic groups other than the one from the trading partner. For example, when we calculate cultural distance between a U.S. industry i and Germany, we exclude German managers in this industry. Formally, we use $I_{i,US,Germany}^{(3)} = \sum_{\ell:\ell\neq Germany} \breve{\lambda}_{\ell i} I_\ell$ to compute $Cultural\ distance_{i,Germany}^{(3)} = |I_{i,US,Germany}^{(3)} - I_{Germany}|$. We take $Cultural\ distance_{i\ell}^{(1)}$ as our baseline measure of cultural differences and consider the other two proxies in the robustness checks.

Before introducing further variables, it is worth pausing to discuss two potential concerns regarding our industry/country measures of cultural distance. First, since managerial choice of industry affiliation is endogenous, one might be worried about reverse causality. In particular, one can envision a situation, in which a manager from a given cultural background decides in favor of a certain industry due to this industry's strong commercial ties with the country of origin of this manager's ancestors. Second, if ethnic composition of an industry is co-determined by its geographic location within the U.S., one might be concerned about the omitted variables bias. We believe that our results are not systematically driven by the two above-mentioned concerns, due to the following three reasons. First, while it is well conceivable that managers choose their industry affiliation or place of residence based on the overall connectedness of the industry or region to the country of their ancestors, it is unlikely that these choices are driven by the fact that firms in this industry import their inputs within firm boundaries rather than at arm's-length (our outcome variable). Second, recall that our dependent variable covers the period 2000-2011, while the measures of cultural distance were constructed using the 2000 U.S. Decennial Census. The time lag of the main explanatory variable thus further mitigates the above-mentioned concerns. Lastly, our third measure of cultural distance, $Cultural\ distance_{il}^{(3)}$ excludes by construction those managers that might have chosen their industry affiliation based on its commercial ties to country of origin of their ancestors.[24]

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[24]   We have also experimented with alternative variants of this index that exclude broadly defined ancestry groups using data on language ties from Mayer and Zignago (2011). For instance, for the construction of cultural distance between a U.S. industry importing from Germany, we exclude managers from countries in which German is the official language (Austria, Switzerland, Luxembourg, Lichtenstein) or spoken by a non-negligible share of population (e.g., Belgium). These alternative measures yield very similar results.

To test our second key hypothesis, we draw from Antràs (2015) the measure of capital intensity of a U.S. industry, $\log(K/L)_i$. This measure is calculated as the (log of the) average real capital stock per worker in a given sector. By investigating the interaction between cultural distance and industry-level capital intensity, the econometric model from equation (17) resembles a difference-in-difference model, which controls for the respective first differences with country/year and industry fixed effects. This approach has been extensively used in the international economics literature to investigate the effect of institutions on trade flows, see, e.g., Chor (2010) and Nunn and Trefler (2014). The distinct feature of our analysis is that the key variable of interest – cultural distance – varies by industry/country (rather than country). This allows us to examine *both* the direct effect of cultural differences, as well as its interaction with capital intensity, while controlling for unobserved heterogeneity across countries using country fixed effects.

Although country/year fixed effects fully control for the direct effect of a foreign country's economic development on the make-or-buy decision, it is conceivable that the role of economic development varies depending on industry-specific characteristics. For instance, a foreign country's income level may have a differential impact on the intra-firm import share depending on income elasticity of the sourced goods. To address this concern related to industry/country-specific confounding factors, we follow the approach by Levchenko (2007) and include in our main specification a full set of interaction terms of industry dummies and a foreign country's GDP per capita, $\log(GDPpc)_{lt}$. In so doing, we control for arbitrary effects of the economic development on firm boundaries across industries. On a related note, Eppinger and Kukharskyy (2017) show that a foreign country's contracting institutions (as measured by the rule of law index) have a differential impact on the integration decision depending on the industry's relationship-specificity. We control for this alternative explanation by adding a full set of interaction terms of industry dummies with $Rule_\ell$, defined as in section 3.1.1.[25]

We mitigate the potential concerns regarding the omitted variables by including in vector $\boldsymbol{X}_{i\ell(t)}$ the following industry/country(-year) controls. To account for standard Heckscher-Ohlin explanations of the structure of international trade, we include the following two interaction effects. To account for a differential impact of a foreign country's capital abundance depending on the capital intensity of an industry, we include *Capital interaction*$_{i\ell t}=\log(K/L)_{\ell t} \times \log(K/L)_i$, where $\log(K/L)_{\ell t}$ is the relative capital abundance of a foreign country in year t, as measured by the log of the ratio of capital stock over population from the Penn World Tables, and $\log(K/L)_i$ is an industry's capital intensity, defined above. Similarly, we control for *Skill interaction*$_{i\ell t} = HC_{\ell t} \times \log(S/E)_i$, where $HC_{\ell t}$ is the time-variant country-

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[25] Note that this approach not only accounts for a differential impact of institutional quality depending on relationship-specificity of an industry's goods, but also across *arbitrary* industry-level characteristics.

level index of human capital per person from the Penn World Tables, constructed based on the average years of schooling and the return to education, and $\log(S/E)_i$ is a measure of an industry's skilled intensity, drawn from Antràs (2015) and measured as the (log of the) average number of non-production (skilled) workers divided by total employment. One might be concerned that the link between cultural distance and intra-firm imports is confounded by other values or beliefs passed on from parents to their descendants. In particular, one could argue that a manager's ethnic background affects his or her understanding of (or reliance on) formal institutions, which, in turn, may have an impact on the make-or-buy decision. To address this concern, we include an industry/country-specific measure of $Institutional\ distance_{i\ell} = |Rule_\ell - \sum_\ell \lambda_{\ell i} Rule_\ell|$, where $Rule_\ell$ is the rule of law index defined in section 3.1.1, and $\lambda_{\ell i}$ is the share of ethnic group ℓ in industry i, see equation (18). In the robustness checks, we consider further industry-country covariates introduced below.

3.2.2 Results

Table 2 reports estimates of equation (17) using the baseline measure of $Cultural\ distance_{i\ell}^{(1)}$. In line with our first hypothesis, the negative and significant raw correlation in column (1) suggests that firms tend to source inputs at arm's-length (rather than within firm boundaries) from countries that are culturally dissimilar to the firms' managers. This relationship alone accounts for almost 8 percent of the variation in intra-firm import shares, which is a large number given the multitude of possible country- and industry-level determinants of the international make-or-buy decision.

To ensure that these relationships are not confounded by omitted variables, columns (2) through (5) gradually include fixed effects and control variables. As mentioned above, the key advantage of our industry/country measure of cultural distance is that it allows for the inclusion of country/year fixed effects to account for unobserved heterogeneity across countries. As can be seen from column (2), the direct effect of cultural distance is fully robust to the inclusion of these fixed effects. In column (3), we control for differential effects of a foreign country's economic development and institutions across U.S. industries using interactions of industry dummies with $\log(GDPpc)_{lt}$ and $Rule_\ell$, respectively. In column (4), we interact cultural distance with the industry's capital intensity and find a pattern consistent with our second key hypothesis: The positive and significant interaction effect suggests that the negative effect of cultural distance on the relative attractiveness of integration is mitigated in industries with high capital intensity. In column (5), we include the above-mentioned industry/country(-year) control variables. In line with our hypotheses, we find that cultural distance has a negative and significant effect on the relative attractiveness of integration vs. arm's-length

contracting, where this effect is less pronounced in industries with high capital intensity.

TABLE 2. *U.S. Intra-firm Import Shares: Industry/country Variation of Cultural Distance (baseline measure).*

	Dependent variable: Intra-firm import share, $IFIS_{i\ell t}$				
	(1)	(2)	(3)	(4)	(5)
Cultural distance$_{i\ell}^{(1)}$	-0.421***	-0.417**	-0.389**	-0.777***	-0.766***
	(0.026)	(0.163)	(0.195)	(0.255)	(0.254)
Cultural distance$_{i\ell}^{(1)} \times \log(K/L)_i$				0.084**	0.080**
				(0.034)	(0.034)
Capital interaction$_{i\ell t}$					0.025*
					(0.015)
Skill interaction$_{i\ell t}$					-0.021
					(0.042)
Institutional distance$_{i\ell}$					2.202
					(5.776)
Country/Year FE	no	yes	yes	yes	yes
Industry FE	no	yes	yes	yes	yes
Industry dummies×$\log(GDPpc)_{\ell t}$	no	no	yes	yes	yes
Industry dummies×$Rule_\ell$	no	no	yes	yes	yes
Observations	23,055	22,998	22,942	22,942	22,674
R^2	0.077	0.375	0.413	0.414	0.412

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The table reports OLS estimates of equation (17) using the baseline measure of *Cultural distance*$_{i\ell}^{(1)}$. See text for details on the definition of variables. Robust standard errors are clustered at the industry/country level and presented in parentheses. ***, **, * denote 1, 5, 10 % significance, respectively.

Table B.2 in Appendix B reruns the specification from Table 2 using alternative measures of cultural distance introduced in section 3.2.1. More specifically, panel A of the Appendix Table uses *Cultural distance*$_{i\ell}^{(2)}$, while panel B employs *Cultural distance*$_{i\ell}^{(3)}$ as the main explanatory variable. Throughout specifications, we continue to find a negative and significant effect of cultural differences on intra-firm import shares, in line with our first hypothesis. Consistent with our second theoretical hypothesis, this effect is less pronounced in capital-intensive industries.

We further validate these strong results in a wide range of unreported robustness checks. First, we construct the industry/country covariates from Table 2 using alternative proxies. For instance, we capture a country's human (physical) capital abundance by the log of human capital to labor (respectively, log of capital to output) ratio relative to the U.S. from Hall and Jones (1999) or a country's average years of schooling from Barro and Lee (2013). Similarly, during the construction of *Institutional distance*$_{i\ell}$, we experiment with alternative measures of institutions from the World Bank and ICRG. Second, we exploit the World Values Survey to construct further industry/country-indices that might capture managerial traits. For instance, to control for differences in (managerial) work ethics, we construct an index *Work ethics*$_{i\ell} =$

$|Work_\ell - \sum_\ell \lambda_{\ell i} Work_\ell|$, where $\lambda_{\ell i}$ is the share of ethnic group ℓ in industry i (constructed by analogy to equation (18)) and $Work_\ell$ is the percentage of population in country ℓ that pick "Hard Work" as the answer to the WVS question "What should children be taught at home?" Throughout robustness checks, we continue to find a negative and significant effect of cultural distance and a positive interaction effect of cultural distance and capital intensity on intra-firm import shares.

3.3 Firm-pair Variation of Cultural Distance

3.3.1 Data and Econometric Specification

This section zooms even further into the link between cultural differences and firm boundaries by considering a novel firm-pair specific measure of cultural distance. All firm-level data used in the current section are drawn from the Orbis database by Bureau van Dijk (BvD) for the year 2014. This dataset has three unique features which are particularly useful for our analysis of cultural determinants of firm boundaries.[26] First, it contains information on the ownership structure of firms – our key outcome variable of interest. More specifically, it provides *firm-pair* specific information on direct ownership shares (in percent) of parent companies in their subsidiaries in 2014. Second, Orbis data provide information on the nationality of the HQ's and subsidiary's top managers, which allows us to calculate *firm-pair* specific measures of cultural distance between parents and their affiliates. Third, the fact that some parents in the dataset own shares of multiple subsidiaries located in different industries and countries, allows us to effectively control for unobservable heterogeneity across countries, industries and firms using a battery of fixed effects.[27]

To investigate the effect of firm-pair specific cultural distance on firm boundaries, we estimate the following econometric model:

$$
\begin{aligned}
O_{hs} = &\ \gamma\, Cultural\ distance_{hs} + \delta\, Cultural\ distance_{hs} \times \log(K/L)_{i\ell_s} \\
&+ \phi_{c_h} + \phi_{\ell_s} + \phi_{j_h} + \phi_{i_s} + \phi_{c_h j_h} + \phi_{\ell_s i_s} + \phi_{d_h \ell_s} + \phi_h + \boldsymbol{x} \boldsymbol{X}_s + \epsilon_{hs},
\end{aligned}
\tag{19}
$$

where O_{hs} denotes one of the two alternative measures of the ownership intensity of a HQ h in its subsidiary s (see below); $Cultural\ distance_{hs}$ represents the firm-pair specific measure of cultural distance; $\log(K/L)_{i\ell_s}$ is the (log of) the average capital intensity in the subsidiary's industry/country, $i\ell$; $\{\phi_{c_h}, \phi_{\ell_s}, \phi_{j_h}, \phi_{i_s}, \phi_{c_h j_h}, \phi_{\ell_s i_s}, \phi_{d_h \ell_s}, \phi_h\}$ is a set of fixed effects introduced further below, where c and and j index a HQ's country and industry, respectively; $\boldsymbol{X}_s$ (with

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[26]   See also https://orbis.bvdinfo.com and Kalemli-Ozcan et al. (2015) for more details on this database.
[27]   To make our analysis consistent with previous sections, we consider only subsidiaries active in manufacturing industries (i.e., with NAICS code between 3311 and 3399).

the associated coefficient vector $\boldsymbol{x}$) denotes the vector of subsidiary controls, and ϵ_{hs} is an error term. The expected signs of the coefficients are $\gamma < 0$ and $\delta > 0$.

As mentioned above, we consider two alternative outcome variables. The first one, O_{hs}^{maj} is a binary variable, which takes the value one if the HQ owns the majority of the subsidiary's equity stake, and zero otherwise. The idea behind this approach is that an ownership link in which a HQ holds more than 50% of a subsidiary's equity stake resembles an integrated relationship, whereas firm pairs in which HQs do not have a controlling interest in the subsidiary are isomorphic to arm's-length cooperations.[28] For the construction of the second variable, we exploit the entire spectrum of direct ownership shares (in percent) of HQs in their subsidiaries. To facilitate the interpretation and comparability between the two measures, we rescale these percentages to a unit interval, i.e. $O_{hs}^{\%} \in (0, 1]$. For each outcome variable, $O_{hs} \in \{O_{hs}^{maj}, O_{hs}^{\%}\}$, we estimate the econometric model from equation (19) by OLS, where the regressions with the binary dependent variable O_{hs}^{maj} are interpreted a linear probability model.[29]

Before turning to the description of the explanatory variables, one comment regarding the continuous dependent variable $O_{hs}^{\%}$ is in order. Why do we expect to see a marginal effect of cultural distance, as well as its interaction with capital intensity, on the integration intensity across the entire spectrum of ownership shares (i.e., even for, say, 20% or 70%), and not just for the binary choice between majority and minority ownership? First, it should be noted that a continuous effect of capital intensity on the integration *intensity* can be well-rationalized within the canonical framework of multinational firm boundaries.[30] Intuitively, a larger ownership share yields the HQ more voting rights in the managing board of the affiliate and marginally strengthens the parent's bargaining position vis-à-vis the subsidiary. This, in turn, improves the HQ's ex-ante incentives to provide relationship-specific capital to the affiliate and makes higher ownership shares more desirable in capital intensive industries. A similar argument can be made for the effect of cultural distance on the integration intensity. A higher involvement in the managing board of the affiliate allows the HQ to coordinate more easily the decisions across two firm units, which comes at a cost of dissatisfaction of the subsidiary's manager. Since these coordination costs are likely to increase in cultural differences between the firms' managers, we expect to see a negative effect of cultural distance on the integration intensity across the entire spectrum of ownership shares. However, this effect is likely to be more pronounced the higher capital intensity of the subsidiary's industry, since a lower ownership share reduces the HQ's incentives to provide relationship-specific capital to the affiliate.

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[28]   Unfortunately, the relationships between strictly independent parties are not reported in the Orbis dataset.

[29]   All econometric models in this paper are estimated using Stata routine `reghdfe` by Correia (2014), which efficiently absorbs high-dimensional fixed effects. It should be noted that the battery of fixed effects used in our analysis render the non-linear models (such as probit or logit) computationally infeasible.

[30]   See Figure 1 in Antràs and Helpman (2004), which depicts the *continuous* optimal revenue share of the HQ as a function of capital intensity. A similar relationship can be obtained using the model by Antràs (2003).

To construct a firm-pair specific measure of cultural distance, we exploit the unique information on the nationality of firms' top managers (CEO, CFO, board of directors, etc.), as reported in the Orbis database. Using Hofstede's individualism scores, we compute the average level of individualism by firm.[31] Figure 2 illustrates as an example the histogram of these scores for firms in Belgium (left) and China (right).[32] Not surprisingly, we observe the spikes around the country's average individualism score (.75 for Belgium and .2 for China). At the same time, there is a substantial variation in cultural backgrounds of firms' managers even within individual countries. We exploit this fact to calculate the firm-pair measure of cultural distance, $Cultural\ distance_{hs} = |I_h - I_s|$, where I_h and I_s denote the individualism index of the HQ and the subsidiary firm, respectively.
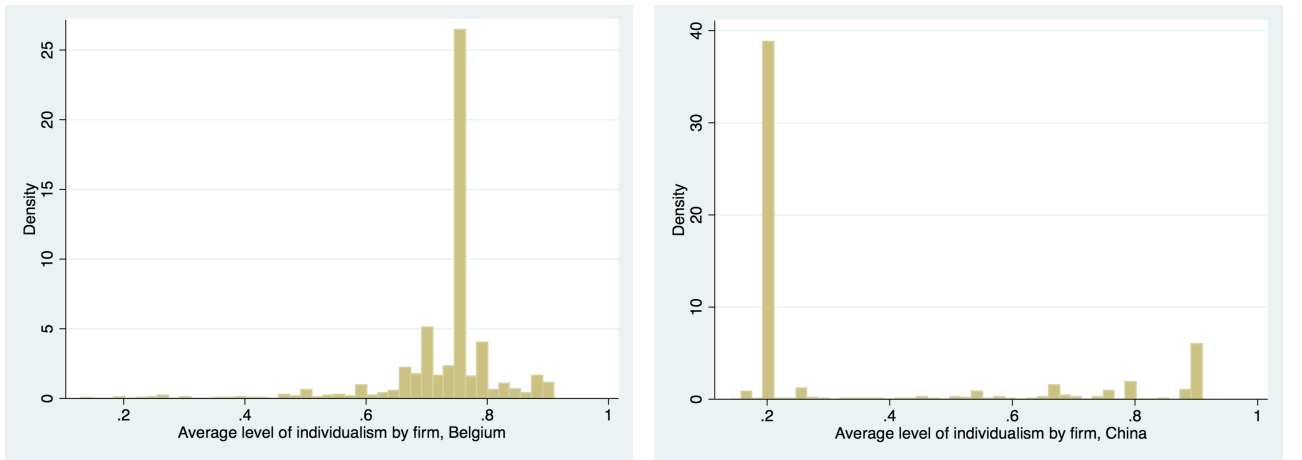

FIGURE 2. *Histogram of individualism levels by firm in Belgium (left) and China (right).*

The measure of capital intensity in the subsidiary's industry/country is constructed using balance sheet information from the Orbis data. More specifically, we calculate the capital-labor ratio of each subsidiary in the database and average this ratio over at least twenty firms to obtain $(K/L)_{i\ell_s}$.[33] We take the log of this measure as a proxy for capital intensity in the subsidiary's industry/country.

Before introducing the set of fixed effects, it is important to understand first the structure of our data. The HQs and their subsidiaries can be located either in the same of in different countries.[34] Furthermore, the two firms can be active either in the same or in different industries, categorized according to the 4-digit NAICS classification.[35] Clearly, the location and industry affiliation of the cooperation partners is likely to affect the firm's ownership structure.

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[31] In the robustness checks, we consider distance measures based on the other four Hofstede's cultural dimensions and alternative cultural categories by Schwartz and World Values Survey.

[32] The number of firms underlying this histogram is 21,830 for Belgium and 20,875 for China.

[33] We consider only industry/countries with minimum twenty observations to mitigate the concern regarding the endogeneity of $(K/L)_{i\ell_s}$ with respect to a firm's ownership structure. We verify that our results are fairly unchanged to considering industry/country cells with a larger number of firms.

[34] The Orbis data report for each firm a unique country code based on the firm's country of incorporation.

[35] The industry code is provided based on the firm's main industry affiliation reported to the BvD.

We effectively account for all country- and industry-specific characteristics using a battery of fixed effects. More specifically, we control for heterogeneity across countries with respect to time-invariant characteristics (such as geography or history) or factors that are relatively stable over time (such as economic development or institutions) via HQ and subsidiary *country* fixed effects, ϕ_{c_h} and ϕ_{ℓ_s}. HQ and subsidiary industry fixed effects, ϕ_{j_h} and ϕ_{i_s}, account for industry-specific factors that have been identified in the literature as important drivers of firm boundaries (such as capital intensity, relationship-specificity, contractibility, etc.), see Antràs (2015). As mentioned in the previous section, the effect of country-level factors on firm boundaries is likely to vary depending on industry-specific characteristics. For instance, the role of contracting institutions in the affiliate's country may be more pronounced in industries with high degree of relationship-specificity, see Eppinger and Kukharskyy (2017). We fully account for this and other country/industry-level determinants of firm boundaries with HQ and subsidiary country/industry fixed effects, $\phi_{c_h j_h}$ and $\phi_{\ell_s i_s}$.[36] The econometric model from equation (19) further includes country-pair fixed effects, which fulfill two important functions. First, they account for whether a given firm pair constitutes a domestic or foreign ownership link. Second, in case of a foreign ownership link, they control for a wide range of country-pair specific factors that may confound the role of cultural distance on firm boundaries (e.g., bilateral investment costs, historical connectedness, geographical distance, etc.). It should be further noted that country-pair fixed effects account for average differences in cultural traits and ethnic ties between countries, allowing us to distill the role of firm-pair specific cultural distance *within* a given country-pair. This approach appears to be well-suited to test our theoretical hypotheses, which emphasize the effect of cultural frictions between firm managers whose cultural backgrounds may or may not be representative of the national culture of their current country of residence.

Although the above-mentioned battery of fixed effects controls for potential confounding factors related to country- and industry-specific factors, there remains a concern regarding omitted variables at the level of HQ firms. For instance, the HQ's productivity has been shown theoretically and empirically to have an impact on firm boundaries, see, e.g., Kohler and Smolka (2015) and Tomiura (2007). Fortunately, our data provide a way to control for unobserved heterogeneity across HQs. More specifically, because parent firms can have multiple subsidiaries located in different countries in our data, we can include HQ firm fixed effects ϕ_h and investigate the role of cultural distance *within* the same HQ. Lastly, we include two observable characteristics of the subsidiary firm – (log of) employment, $\log(Employment)_s$,

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[36]   Since all firms in our database have a unique country and industry affiliation, HQ and affiliate country and industry fixed effects $\{\phi_{c_h}, \phi_{\ell_s}, \phi_{j_h}, \phi_{i_s}\}$ are nested within country/industry fixed effects $\{\phi_{c_h j_h}, \phi_{\ell_s i_s}\}$.

and (log of) revenue, $\log(Revenue)_s$ – to control for the subsidiary's size and profitability.

3.3.2 Results

We start our empirical investigation of the econometric model from equation (19) using the binary variable O_{hs}^{maj} as an outcome variable. Table 3 develops our preferred specification step by step.[37] In the basic specification of column (1), we regress O_{hs}^{maj} against *Cultural distance$_{hs}$*, controlling for HQ and subsidiary country and industry fixed effects. Consistent with our first theoretical prediction, we find that the HQ is less likely to hold a majority (rather than minority) ownership stake in its subsidiary the higher cultural distance between the firms' managers. In column (2), we apply a more demanding test, by including HQ and subsidiary country/industry FE. In so doing, we effectively control for a differential impact of country-specific factors depending on an industry's characteristics. The estimated coefficient on *Cultural distance$_{hs}$* somewhat decreases in size but remains significant. In column (3), we further add country-pair fixed effects, which fully account for all factors specific to a pair of countries. The estimate of *Cultural distance$_{hs}$* increases in magnitude and retains the significance at the 1% level. Most importantly, we continue to find a negative and significant effect of cultural distance on the HQ's probability to choose a majority rather than a minority ownership share in the subsidiary's company after controlling for HQ firm fixed effects in column (4). To illustrate the economic significance of this effect, consider a HQ firm managed by a French manager, which has two subsidiaries, where the first one is managed by a Belgian and the second by a Chinese manager. Our estimate from column (4) suggests that, on average, a French-led HQ firm is 10% less likely to hold a majority ownership in the affiliate managed by a Chinese manager compared to the one led by a Belgian manager.[38] It should be noted that these estimates are not confounded by the location of the two affiliates, since all country-specific factors (including policy restrictions on foreign equity ownership) are fully accounted for via country and country-pair fixed effects. Furthermore, they are not driven by the fact that the two affiliates are active in different industries, which is controlled for via industry fixed effects. Most importantly, since the effect is estimated *within* a HQ firm, it fully accounts for unobserved heterogeneity across parent companies (e.g., with respect to productivity).

In column (5), we add to our specification the interaction term of *Cultural distance$_{hs}$* and capital intensity, $\log(K/L)_{i\ell_s}$. In line with our second key hypothesis, the estimate of this interaction effect is positive and significant, suggesting that the negative effect of cultural distance on firm boundaries is mitigated in industries with high capital intensity. Both the

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[37] It should be noted at the outset that, since the measure of capital intensity is available only for a subset of industries, we examine its interaction with cultural distance only after the inclusion of all fixed effects.
[38] The distance between French and Belgian cultural backgrounds with respect to individualism is 0.04 points on the unit interval, while it is 0.51 points between French and Chinese cultures.

| | Dependent variable: Majority ownership dummy, O_{hs}^{maj} | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)
Cultural distance$_{hs}$	-0.142***	-0.106***	-0.179***	-0.204***	-0.630***	-0.679***
	(0.032)	(0.034)	(0.040)	(0.056)	(0.168)	(0.207)
Cultural distance$_{hs}$×log$(K/L)_{i\ell_s}$					0.096***	0.121***
					(0.036)	(0.046)
log$(Employment)_s$						-0.002
						(0.005)
log$(Revenue)_s$						-0.007
						(0.004)
HQ country FE	yes	nested	nested	nested	nested	nested
Subsidiary country FE	yes	nested	nested	nested	nested	nested
HQ industry FE	yes	nested	nested	nested	nested	nested
Subsidiary industry FE	yes	nested	nested	nested	nested	nested
HQ country/industry FE	no	yes	yes	nested	nested	nested
Subsidiary country/industry FE	no	yes	yes	yes	yes	yes
Country-pair FE	no	no	yes	yes	yes	yes
HQ firm FE	no	no	no	yes	yes	yes
Observations	55,942	54,019	53,689	24,499	21,645	15,857
R^2	0.234	0.349	0.356	0.792	0.771	0.770

Notes: The table reports OLS estimates of equation (19) with a binary outcome variable O_{hs}^{maj}, which is equal to one if the HQ (h) owns the majority of the subsidiary's (s) equity stake and zero otherwise. See text for details on the definition of variables. Robust standard errors are clustered at the level of HQ firm and presented in parentheses. ***, **, * denote 1, 5, 10 % significance, respectively.

direct and the interaction effect retain the predicted sign and are significant in column (6) which additionally controls for the subsidiary's size.

Table 4 reruns the regressions from Table 3 using the continuous ownership share $O_{hs}^{\%}$ as a dependent variable. Throughout specifications, we find a negative and significant effect of cultural distance on the HQs' ownership shares in their subsidiaries. A quantitative interpretation of the effect of cultural distance on ownership shares estimated in column (4), which controls for HQ firm fixed effects, can once again be provided using the above-mentioned example of a HQ and two affiliates. The HQ firm governed by a French manager chooses on average a 9% lower ownership share in the affiliate company led by a Chinese manager, as compared to an affiliate led by a Belgian manager. In line with our second theoretical hypothesis, we also find that the negative effect of cultural distance on ownership shares is mitigated in capital intensive industries.

In our analysis so far, we have measured cultural distance using the individualism vs. collectivism index by Hofstede. Table 5 verifies the robustness of our results to considering a wide range of alternative cultural dimensions. In panel A, we consider the remaining four Hofstede's dimensions: power distance (strength of social hierarchy), uncertainty avoidance (sensitivity to ambiguity and uncertainty), masculinity-femininity (task orientation

TABLE 4. *Ownership Shares and Firm-pair Variation of Cultural Distance.*

	Dependent variable: Ownership share, $O_{hs}^{\%}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Cultural distance$_{hs}$	-0.152***	-0.127***	-0.197***	-0.186***	-0.501***	-0.492***
	(0.026)	(0.028)	(0.032)	(0.045)	(0.130)	(0.157)
Cultural distance$_{hs} \times \log(K/L)_{i\ell_s}$					0.065**	0.072**
					(0.030)	(0.036)
$\log(Employment)_s$						-0.003
						(0.004)
$\log(Revenue)_s$						-0.002
						(0.003)
HQ country FE	yes	nested	nested	nested	nested	nested
Subsidiary country FE	yes	nested	nested	nested	nested	nested
HQ industry FE	yes	nested	nested	nested	nested	nested
Subsidiary industry FE	yes	nested	nested	nested	nested	nested
HQ country/industry FE	no	yes	yes	nested	nested	nested
Subsidiary country/industry FE	no	yes	yes	yes	yes	yes
Country-pair FE	no	no	yes	yes	yes	yes
HQ firm FE	no	no	no	yes	yes	yes
Observations	55,942	54,019	53,689	24,499	21,645	15,857
R^2	0.297	0.420	0.428	0.837	0.816	0.816

Notes: The table reports OLS estimates of equation (19) with continuous outcome variable $O_{hs}^{\%}$, measuring the direct ownership share (in percent) of a HQ h in its subsidiary s. See text for details on the definition of variables. Robust standard errors are clustered at the level of HQ firm and presented in parentheses. ***, **, * denote 1, 5, 10 % significance, respectively.

versus person-orientation), and long-term orientation (focus on future rather than present outcomes). In panel B, we exploit alternative cultural dimensions suggested by Schwartz (2006): harmony, embeddedness, hierarchy, mastery, affective autonomy, intellectual autonomy, and egalitarianism. In panel C, we exploit measures of cultural distance based on differences in average answers to questions from the World Values Survey (WVS), as suggested by Desmet et al. (2007) and Spolaore and Wacziarg (2015). More specifically, the authors develop a novel methodology that aggregates roughly 100 questions from the WVS on perceptions of life, work, family, politics and society, and religion and moral into country-pair indices of cultural distance. To economize on space, Table 5 reports the results both for the binary (O_{hs}^{maj}) and the continuous dependent variable $(O_{hs}^{\%})$. For each outcome variable, the first column reports the estimates of γ from equation (19), whereas the second column presents the estimates of δ. For each cultural dimension, we report only the preferred specification, which includes the full set of fixed effects and controls from Table 3. As can be seen from Table 5, the relative attractiveness of integration continues to be negatively and generally significantly associated with cultural distance regardless of the employed definition of the latter variable, both for the binary and the continuous outcome variable. Furthermore, in line with our second testable hypothesis, the interaction effect of cultural distance and capital intensity is positive

TABLE 5. *Alternative Measures of Cultural Distance.*

| | Dependent variable: O_{hs}^{maj} | | Dependent variable: $O_{hs}^{\%}$ | |
| | Direct correlation (1) | Interaction with capital intensity (2) | Direct correlation (3) | Interaction with capital intensity (4) |
Cultural dimensions				
Panel A. Hofstede				
Power distance	-0.399**	0.070*	-0.341***	0.046
	(0.165)	(0.038)	(0.125)	(0.031)
Uncertainty avoidance	-0.367**	0.072**	-0.317***	0.047*
	(0.151)	(0.036)	(0.115)	(0.028)
Masculinity-femininity	-0.398***	0.086***	-0.208**	0.020
	(0.135)	(0.033)	(0.100)	(0.023)
Long-term orientation	-0.289*	0.054	-0.284**	0.032
	(0.161)	(0.039)	(0.135)	(0.033)
Panel B. Schwartz				
Harmony	-0.305***	0.049*	-0.245***	0.035*
	(0.106)	(0.026)	(0.081)	(0.019)
Embeddedness	-0.296***	0.060**	-0.265***	0.048*
	(0.112)	(0.028)	(0.099)	(0.025)
Hierarchy	-0.304***	0.042**	-0.220***	0.025
	(0.094)	(0.020)	(0.069)	(0.016)
Mastery	-0.764***	0.148***	-0.712***	0.131***
	(0.260)	(0.057)	(0.184)	(0.041)
Affective autonomy	-0.241***	0.040**	-0.223***	0.033**
	(0.082)	(0.019)	(0.068)	(0.016)
Intellectual autonomy	-0.318***	0.072***	-0.276***	0.057***
	(0.098)	(0.023)	(0.081)	(0.019)
Egalitarianism	-0.356***	0.073**	-0.213**	0.039
	(0.119)	(0.029)	(0.098)	(0.025)
Panel C. World Values Survey				
Perceptions of life	-0.215*	0.026	-0.254**	0.028
	(0.128)	(0.022)	(0.110)	(0.019)
Work	-0.539*	0.101	-0.672***	0.121***
	(0.283)	(0.052)	(0.237)	(0.043)
Family	-0.824**	0.148**	-0.806**	0.135**
	(0.384)	(0.068)	(0.330)	(0.058)
Politics and society	-0.279*	0.032	-0.281**	0.028
	(0.145)	(0.024)	(0.120)	(0.020)
Religion and morale	-0.197	0.070*	-0.327*	0.088**
	(0.221)	(0.041)	(0.194)	(0.035)

Notes: The table reports OLS estimates of equation (19) with the full set of fixed effects and control variables from column (6) of Table 3. The outcome variable in columns (1) and (2) is O_{hs}^{maj}, and the outcome variable in columns (3) and (4) is $O_{hs}^{\%}$. Panels A, B, and C consider alternative measures of *Cultural distance$_{hs}$*, constructed using cultural dimensions from Hofstede, Schwartz, and the World Values Survey, respectively. Columns (1) and (3) present direct correlations of *Cultural distance$_{hs}$* with O_{hs}^{maj} and $O_{hs}^{\%}$, respectively. Columns (2) and (4) report the interactions of *Cultural distance$_{hs}$* with capital intensity $\log(K/L)_{i\ell_s}$ in their impact on O_{hs}^{maj} and $O_{hs}^{\%}$, respectively. The R^2 and the number of observations vary by the employed measure, but are generally comparable to column (6) of Table 3. Robust standard errors are clustered at the level of HQ firm and presented in parentheses. ***, **, * denote 1, 5, 10 % significance, respectively.

throughout specifications, and it is significant at least at the 10% level in twenty one out of thirty two cases. Note that many of these cultural distance variables are not as strong as cultural distance along the individualism-collectivism dimension. Cultural distance measures

based on Schwartz (2006) tend to be most significant. This is not too surprising. Harmony, embeddedness and hierarchy are correlated with collectivism whereas mastery, affective and intellectual autonomy are correlated with individualism. These results tend to suggest that cultural differences along the individualism-collectivism dimension matter most robustly in terms of cultural frictions in business and firm relationships.

TABLE 6. *Ownership Structure and Firm-pair Cultural Distance (alternative industry samples).*

	Dependent variable: O_{hs}^{maj} $j_h \neq i_s$	Dependent variable: $O_{hs}^{\%}$ $j_h \neq i_s$
Cultural distance$_{hs}$	-0.730***	-0.632***
	(0.232)	(0.181)
Cultural distance$_{hs} \times \log(K/L)_{i\ell_s}$	0.146***	0.121***
	(0.049)	(0.041)
Subsidiary country/industry FE	yes	yes
Country-pair FE	yes	yes
HQ firm FE	yes	yes
Subsidiary controls from Table 3	yes	yes
Observations	110,099	12,998
R^2	0.692	0.835

Notes: The table reports OLS estimates of equation (19) with the full set of fixed effects and control variables from column (6) of Table 3. The outcome variable is O_{hs}^{maj} in columns (1) and (2) and $O_{hs}^{\%}$ in columns (3) and (4). Columns (1) and (3) consider all (including non-manufacturing) industries, while columns (2) and (4) restrict the sample to affiliates located in manufacturing industries which are different from the HQs' industries. See text for details on the definition of variables. Robust standard errors are clustered at the level of HQ firm and presented in parentheses. ***, **, * denote 1, 5, 10 % significance, respectively.

Table 6 further verifies the robustness of our results to using alternative samples. In columns (1) and (2) of Table 6, we consider only those firm-pairs in which a HQ is active in a different industry than its subsidiaries (i.e., $j_h \neq i_s$). The idea behind this robustness check is that the theoretical framework by Antràs (2003) is commonly interpreted as the model of vertical (rather than horizontal) integration. Since subsidiaries active in a different industry from their parent company are less likely to replicate the activity of the HQ, by excluding firm-pairs active in the same industry, the restricted sample is more likely to contain vertical rather than horizontal relationships.[39] Table 6 shows that both the direct and the interaction effects are in line with our theoretical predictions and significant. Overall, the evidence uncovered in the three-pronged approach suggests that higher cultural distance decreases the relative attractiveness of integration, yet this effect is less pronounced the higher capital intensity in the subsidiary's industry.

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[39] The same approach has been applied by Alfaro and Charlton (2009) and Fajgelbaum et al. (2015).

4 Conclusion

This paper provides a systematic analysis of the relationship between cultural distance and multinational firm boundaries. To guide our empirical investigation, we develop a simple theoretical model which suggests that multinational firms are less likely to integrate their business partners into firm boundaries the higher the cultural distance between the firms' managers. Moreover, our model predicts that the negative effect of cultural distance on the relative attractiveness of integration is mitigated in capital-intensive industries. Combining product/country, and industry/country and firm-pair data with various proxies for cultural differences, we find strong empirical support for the model's predictions. These results are robust to controlling for a host of unobserved country-, industry-, and firm-specific factors via fixed effects. We conclude that cultural distance is an important determinant of the multinational firms' boundaries that has been previously understudied by economics literature.

While our paper sheds new light on the interaction between cultural distance and capital intensity in their impact on firm boundaries, we see it merely as a stepping stone towards obtaining a more profound picture of the differential effect of culture across various country- and industry-specific characteristics. In particular, it may be interesting to explore whether the relationship between cultural distance and firm boundaries systematically varies depending on the institutional quality (in particular, with respect to contracting institutions). Given that introduction of this additional interaction effect into our theoretical model and its empirical investigation would go beyond the scope of the current paper, we relegate it to future research.

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A   Theoretical Appendix

A.1   Parameter Restriction on Bargaining Power

In the face of contractual incompleteness, the HQ is willing to provide capital to the manufacturer only if the associated profit is higher than in the case when the manufacturer conducts itself the relationship-specific investments into relationship-specific capital. In the latter case, M would choose K and L which maximize $(1 - \phi)R - rK - wL$, and H obtains from the ex-post bargaining the payoff ϕR. As shown by Antràs (2003), the sufficient condition for H to be willing to provide capital to M is given by $\phi > 1/2$. Since this parameter restriction directly follows from the proof in Appendix 1 in Antràs (2003), we refrain from replicating the proof in the current paper and refer the interested reader to the original source.

A.2   Proof of Proposition 2

The cross-partial derivative of Θ from equation (13) with respect to $g(c)$ and β reads after simplification:

$$\frac{\partial^2 \Theta}{\partial g(c) \partial \beta} = \frac{\phi^{-\frac{\beta \alpha}{1-\alpha}} (1 - \phi)^{-\frac{(1-\beta)\alpha}{1-\alpha}} \alpha g(c)^{-\frac{(1-\beta)\alpha}{1-\alpha}} \Omega}{(1 - \alpha)(1 - \alpha[\phi \beta + (1 - \phi)(1 - \beta)])^2},$$

where

$$\Omega \equiv (1 - \alpha \phi)(1 - \alpha) - \alpha(1 - \beta)(1 - \alpha[\phi \beta + (1 - \phi)(1 - \beta)])[\ln(g(c)) - \ln(\phi) + \ln(1 - \phi)].$$

Note that the sign of $\frac{\partial^2 \Theta}{\partial g(c) \partial \beta}$ is determined by the sign of Ω. In general, the latter sign cannot be assigned without ambiguity for all possible parameter values. However, it is positive if $g(c)$ is sufficiently low. To see this, note that $\frac{\partial \Omega}{\partial g(c)} = -\alpha(1-\beta)(1-\alpha[\phi\beta+(1-\phi)(1-\beta)])/g(c) < 0$ $\forall \alpha, \beta, \phi \in (0, 1)$, and $g(c) > 1$. Hence, solving Ω for $g(c)$ yields the cutoff value of governance cost $\bar{g}$, such that $\frac{\partial^2 \Theta}{\partial g(c) \partial \beta} > 0$ for all $g(c) < \bar{g}$, defined in equation (14).

To assess the likelihood of $g(c) < \bar{g}$ to hold, we numerically simulate this condition for various combinations of parameter values. More specifically, we fix the value of $\alpha = \frac{\sigma - 1}{\sigma}$ and depict possible combinations of $\beta \in (0, 1)$, $\phi \in (1/2, 1)$, and $g(c) > 1$, which fulfill $\Omega = 0$. The estimated values of σ commonly assumed in the literature are $\sigma = 3$ and $\sigma = 4$, see, e.g., Head and Mayer (2014) and Simonovska and Waugh (2014). These values are used in Figures 3(A) and 3(B), respectively. The plane depicted in these figures illustrates the parameter combinations for which $\Omega = 0$, where we have $\Omega > 0$ below this plane and $\Omega < 0$ above this plane. As can be seen from both figures, for the vast majority of parameter values $\Omega > 0$, where $\Omega < 0$ holds only for very high values of g, accompanied with low values of ϕ and β.

To further explore whether $g(c) < \bar{g}$ is satisfied in the data, we regress log average wage of local firms on the share of foreign ownerhsip (or a dummy variable equal to one if foreign owners have a majority stake in a local firm), cultural distance, and the interaction of cultural distance and foreign ownership as well as other controls (e.g., level of capital stock, industry and country fixed effects) to get a sense of how large $g(c)$ could be in the data. Consistently across specifications estimated on the Orbis data, we find that local firms with foreign ownership pay a wage premium and it is increasing in cultural distance. But even for the extreme case of full foreign owenership and maximum cultural distance observed in the data, our estimates imply that $g(c) < 1.3$. Hence, this finding and our theoretical analysis above imply that $g(c) < \bar{g}$ is likely satisfied.

FIGURE 3. *Combinations of $\beta \in (0,1)$, $\phi \in (1/2,1)$, and $g \in (1,4)$ that satisfy $\Omega = 0$.*

(A) $\sigma = 3$

(B) $\sigma = 4$
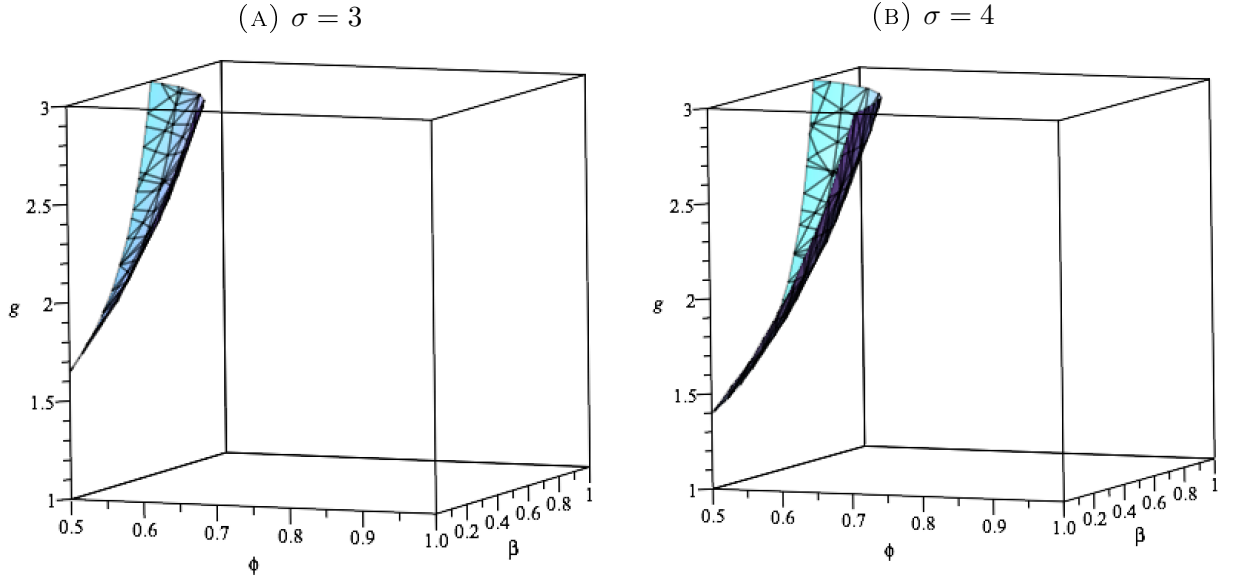
A.3 Alternative Modeling of Governance Cost

Unlike in the main text, we assume now that an integrating HQ incurs additional governance costs not only with respect to the enforcement of labor in the manufacturing unit, but also while transferring the capital to the manufacturer. Assuming for simplicity that both governance costs can be captured with the same $g(c) > 1$, the maximization problem under integration reads:

$$\max_{K,L} R - g(c)rK - g(c)wL. \tag{20}$$

Following the approach delineated in the main text, one can easily derive the overall profit under integration:

$$\Pi = (1-\alpha)g(c)^{-\frac{\alpha}{1-\alpha}}B \equiv \Pi_I. \tag{21}$$

Setting this profit in relationship to profit under outsourcing, given by equation (8), we obtain the ratio capturing the relative attractiveness of integration:

$$\Theta = \frac{(1-\alpha)g(c)^{-\frac{\alpha}{1-\alpha}}}{(1-\alpha[\phi\beta + (1-\phi)(1-\beta)])\phi^{\frac{\beta\alpha}{1-\alpha}}(1-\phi)^{\frac{(1-\beta)\alpha}{1-\alpha}}}. \tag{22}$$

Since $\frac{\partial\Theta}{\partial c} = -\frac{\alpha\Theta}{(1-\alpha)g(c)}\frac{\partial g(c)}{\partial c} < 0 \ \forall \alpha, \Theta, g(c), \frac{\partial g(c)}{\partial c} > 0$, Proposition 1 continues to hold in this extended model.

The cross-partial derivative of Θ from equation (22) with respect to $g(c)$ and β reads after simplification:

$$\frac{\partial^2\Theta}{\partial g(c)\partial\beta} = \frac{\phi^{-\frac{\beta\alpha}{1-\alpha}}(1-\phi)^{-\frac{(1-\beta)\alpha}{1-\alpha}}\alpha^2 g(c)^{-\frac{\alpha}{1-\alpha}}\Phi}{(1-\alpha)(1-\alpha[\phi\beta + (1-\phi)(1-\beta)])^2},$$

where

$$\Phi \equiv (1-\alpha[\phi\beta + (1-\phi)(1-\beta)])[\ln(\phi) - \ln(1-\phi)] - (2\phi - 1)(1-\alpha). \tag{23}$$

Note that the sign of $\frac{\partial^2\Theta}{\partial g(c)\partial\beta}$ is determined by the sign of Φ. To prove that $\Phi > 0$, we differentiate Φ with respect to β:

$$\frac{\partial\Phi}{\partial\beta} = -\alpha(2\phi - 1)[\ln(\phi) - \ln(1-\phi)].$$

It can be easily verified that $\frac{\partial\Phi}{\partial\beta} < 0$ for all $\alpha \in (0,1)$ and $\phi \in (1/2, 1)$. Hence, if $\Phi \geq 0$ for the highest possible $\beta = 1$, $\Phi \geq 0$ holds a fortiori for all $\beta \in (0,1)$. Plugging $\beta = 1$ into equation (23) yields

$$\Phi|_{\beta=1} = (1-\alpha\phi)[\ln(\phi) - \ln(1-\phi)] - (2\phi - 1)(1-\alpha). \tag{24}$$

To prove that $\Phi|_{\beta=1} \geq 0$, we differentiate $\Phi|_{\beta=1}$ with respect to α:

$$\frac{\partial\Phi|_{\beta=1}}{\partial\alpha} = -\phi[\ln(\phi) - \ln(1-\phi)] + 2\phi - 1.$$

It can be verified that $\frac{\partial\Phi|_{\beta=1}}{\partial\alpha} < 0$ for all $\phi \in (1/2, 1)$. Hence, if $\Phi|_{\beta=1} \geq 0$, for the highest possible $\alpha = 1$, $\Phi|_{\beta=1} \geq 0$ holds a fortiori for all $\alpha \in (0,1)$. Substituting $\alpha = 1$ in equation (24), we obtain

$$\Phi|_{\beta=1,\alpha=1} = (1-\phi)[\ln(\phi) - \ln(1-\phi)],$$

which is positive for all $\phi \in (1/2, 1)$. We have thus shown that $\frac{\partial^2\Theta}{\partial g(c)\partial\beta} > 0$ for all permissible parameter values.

A.4 Continuous Integration Decision

To incorporate the notion of continuous ownership shares, we need to impose additional structure on our baseline framework. In particular, assume that the production factors capital and labor from equation (2) are composed, respectively, of a continuum of capital and labor inputs, $K(i)$ and $L(i)$, indexed by points on the unit interval $i \in [0, 1]$, and combined into K and L according to the Cobb-Douglas production functions:

$$K = \exp\left[\int_0^1 \ln K(i)\mathrm{d}i\right], \qquad L = \exp\left[\int_0^1 \ln L(i)\mathrm{d}i\right]. \tag{25}$$

To formalize the idea of continuous ownership shares $s \in [0, 1]$, we assume that capital and labor investments in the range $i \in [0, s]$ can be enforced by fiat, while the remaining investments are chosen by the respective party in a non-cooperative manner.[40]

As in the baseline model, enforcement of labor inputs within firm boundaries is associated with exogenous governance cost $g(c)$, which are assumed to be increasing in cultural distance. To keep the model as simple as possible, we assume the same governance cost $g(c)$ for all labor inputs $L(i)$, $i \in [0, s]$. The timing of this extended game is as follows. In t_0, H chooses the ownership share $s \in [0, 1]$ in M, while the latter conducts to H the lump-sum transfer T. In t_1, H chooses the amounts of $K(i)$ and $L(i)$ within the range $i \in [0, s]$. In t_2, H chooses the amount of $K(i)$, $i \in (s, 1]$, while M invests into $L(i)$, $i \in (s, 1]$. In t_3, the parties negotiate the surplus from the relationship using generalized Nash bargaining. In t_4, final goods are produced and the revenue is realized.

Consider first investment decisions in period t_2. Both parties anticipate the outcome of Nash bargaining from period t_3 and choose non-cooperatively the amounts of inputs which maximize their payoffs from the ex-post negotiations net of production costs of these inputs. More specifically, H's and M's maximization problems are given, respectively, by:

$$\max_{\{K(i)\}_{i=s}^1} \phi R - r \int_s^1 K(i)\mathrm{d}i, \qquad \max_{\{L(i)\}_{i=s}^1} (1 - \phi)R - w \int_s^1 L(i)\mathrm{d}i.$$

Using equations (1), (2), and (25), these maximization problems yield the amounts of capital

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[40] The reader familiar with the model by Antràs and Helpman (2008) will notice some resemblance of our approach to the latter contribution. More specifically, the authors consider a production process qualitatively similar to the one imposed in equation (25) and assume that inputs within the range $i \in [0, \mu]$, $0 \le \mu \le 1$, can be contractually stipulated, while the remaining inputs $i \in (\mu, 1]$ cannot be enforced by the courts. Apart from different focus of our analysis, the key distinct feature of our model compared to Antràs and Helpman (2008) is that the variable $s \in [0, 1]$, splitting the unit interval $i \in [0, 1]$, is endogenously chosen.

and labor chosen non-cooperatively (n) within the range $i \in (s, 1]$:

$$K(i) = \phi \frac{\beta \alpha R}{r} \equiv K_n \, \forall \, i \in (s, 1], \qquad L(i) = (1 - \phi)\frac{(1 - \beta)\alpha R}{w} \equiv L_n \, \forall \, i \in (s, 1], \qquad (26)$$

as a function of revenue, obtained from plugging equations (2), (25), and (26) into equation (1), and solving the resulting expression for R:

$$R = \left(\left(\frac{\exp\left[\int_0^s \ln K(i)\mathrm{d}i\right]\left(\frac{\phi\beta\alpha}{r}\right)^{1-s}}{\beta}\right)^{\beta}\left(\frac{\exp\left[\int_0^s \ln L(i)\mathrm{d}i\right]\left(\frac{(1-\phi)(1-\beta)\alpha}{w}\right)^{1-s}}{1 - \beta}\right)^{1-\beta}\right)^{\frac{\alpha}{1-\alpha(1-s)}} A^{\frac{1-\alpha}{1-\alpha(1-s)}}.$$
$$(27)$$

It is immediate from the comparison of equations (4) and (26) that, for any given level of revenue R, the investment chosen non-cooperatively by the respective party is below the first-best optimal level. As in the baseline model, this underinvestment results from the hold-up problem faced by both parties under contractual incompleteness.

The ex-ante lump-sum transfer ensures that the HQ maximizes in t_1 the total profit from the relationship:

$$\max_{\{K(i)\}_{i=0}^{s}, \{L(i)\}_{i=0}^{s}} \Pi = R - r\left(\int_0^s K(i)\mathrm{d}i + \int_s^1 K(i)\mathrm{d}i\right) - w\left(\int_s^1 L(i)\mathrm{d}i - g(c)\int_0^s L(i)\mathrm{d}i\right).$$

Using the amounts of $K(i)$ and $L(i)$, $i \in (s, 1]$, from equation (26) therein, this maximization problem can be rewritten as:

$$\max_{\{K(i)\}_{i=0}^{s}, \{L(i)\}_{i=0}^{s}} \Pi = \chi R - r\int_0^s K(i)\mathrm{d}i - wg(c)\int_0^s L(i)\mathrm{d}i, \qquad (28)$$

where R is given by equation (27) and $\chi \equiv 1 - \alpha(1 - s)(\phi\beta + (1 - \phi)(1 - \beta))$ is a parameter defined for notational simplicity. This maximization problem yields the amounts of capital and labor enforced by fiat (f) within the range $i \in [0, s]$:

$$K(i) = \frac{\chi}{1 - \alpha(1 - s)}\frac{\beta\alpha R}{r} \equiv K_f \, \forall \, i \in [0, s], \quad L(i) = \frac{\chi}{1 - \alpha(1 - s)}\frac{(1 - \beta)\alpha R}{wg(c)} \equiv L_f \, \forall \, i \in [0, s],$$
$$(29)$$

where

$$R = \left(\left(\frac{\chi}{1 - \alpha(1 - s)}\right)^s \phi^{\beta(1-s)}(1 - \phi)^{(1-\beta)(1-s)}g(c)^{-s(1-\beta)}\right)^{\frac{\alpha}{1-\alpha}}. \qquad (30)$$

Notice from the comparison of equations (26) and (29) that, for any given level of revenue, we have $K_f > K_n$.[41] Intuitively, to the extent that the HQ integrates the manufacturing

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[41] Formally, this results from the fact that $\frac{\chi}{1-\alpha(1-s)} \geq 1 \, \forall \alpha, \beta, \phi \in (0, 1)$ and $s \in [0, 1]$. However, it can be easily verified that K_f is below the first-best optimal level K^* from equation (4), since the revenue R

producer more tightly into firm boundaries, she mitigates future hold-up by the manufacturer and improves her incentives to invest into relationship-specific capital. As in the baseline model, the relationship $L_f \gtrless L_n$ cannot be assigned without ambiguity. Although labor investments enforced by fiat are no longer plagued by hold-up inefficiencies, they are lower than in the first-best case due to the governance cost $g(c) > 1$.

Utilizing equations (27) and (29) in equation (28) the optimal profit under partial ownership reads as:

$$\Pi = (1 - \alpha)B \left(\left(\frac{\chi}{1 - \alpha(1-s)} \right)^{1-\alpha(1-s)} \phi^{\alpha\beta(1-s)}(1-\phi)^{\alpha(1-\beta)(1-s)}g(c)^{-\alpha s(1-\beta)} \right)^{\frac{1}{1-\alpha}}. \quad (31)$$

In t_0, H chooses the ownership share which maximizes this profit. Solving the first-order condition of this maximization problem with respect to s yields the optimal ownership share:

$$s^* = \frac{-(1 - \alpha(\phi\beta + (1-\phi)(1-\beta)))W(\Psi) - (1-\alpha)(\phi\beta + (1-\phi)(1-\beta))}{\alpha(\phi\beta + (1-\phi)(1-\beta)[1 + W(\Psi)]}, \quad (32)$$

where $W(\cdot)$ is the Lambert-W function and

$$\Psi \equiv -\frac{(\phi\beta + (1-\phi)(1-\beta))e^{\beta \ln\left(\frac{(1-\phi)g(c)}{\phi} \right) - 1}}{g(c)(1-\phi)}$$

is a parameter defined for notational simplicity. It can be immediately seen that $\Psi < 0$ for all permissible parameter values. Given the properties of the Lambert-W function, $W(\Psi)$ in equation (32) is strictly negative and is defined over the interval $(-1/e, 0]$. Notice for further purposes that this implies $[1 + W(\Psi)] > 0$ for any value of Ψ.[42]

Differentiating s^* with respect to $g(c)$ yields after simplification

$$\frac{\partial s^*}{\partial g(c)} = \frac{(1-\beta)(\beta + \phi - 2\beta\phi)W(\Psi)}{\alpha g(c)(\phi\beta + (1-\phi)(1-\beta))[1 + W(\Psi)]^3} < 0. \quad (33)$$

The sign of this first-order derivative results immediately from the fact that $W(\Psi) < 0$, $[1 + W(\Psi)] > 0$, and $(\beta + \phi - 2\beta\phi) > 0$ for all $\beta, \phi \in (0,1)$. Since $\frac{\partial g(c)}{\partial c} > 0$ by Assumption 1, this proves that the H's optimal ownership share s^* in M decreases in cultural distance between the firms' managers, $\frac{\partial s^*}{\partial c} > 0$. This leads us to conclude that Proposition 1 extends to the case of a continuous integration decision. Unfortunately, this extended model no longer allows for an analytically tractable investigation of the interaction effect between cultural

from equation (30) is smaller than the revenue under complete contracts, R^*.

[42] Tedious but straightforward analysis shows that $s^* \geq 0$ for all permissible parameter values. Yet, if $g(c)$ is sufficiently small, s^* from equation (32) may turn out to be larger than one. To ensure that s^* lies within the unit interval, we have to impose the following parameter restriction: $g(c) \geq \frac{\phi}{1-\phi} e^{-\frac{\ln(\phi) + \beta + \phi - 2\beta\phi}{1-\beta}} \equiv \tilde{g}$.

distance and capital intensity in their impact on the ownership share, $\frac{\partial^2 s^*}{\partial g(c) \partial \beta}$. However, we run extensive numerical simulations to verify that, under the parameter restriction formulated in the footnote 42, the relationship $\frac{\partial^2 s^*}{\partial g(c) \partial \beta} > 0$ pertains under the vast majority of permissible parameter values.

B   Appendix Tables and Figures

TABLE B.1. *Descriptive Statistics*

Variables	Obs	Mean	Std. Dev.	Min	Max
Cross-country variation of cultural distance:					
Intra-firm import share, $IFIS_{p\ell t}$	1,340,371	0.234	0.346	0.000	1.000
Cultural distance$_{US,\ell}$	1,340,371	0.432	0.248	0.010	0.850
Geographical distance$_{US,\ell}$	1,340,371	8.986	0.488	7.639	9.650
Common border$_{US,\ell}$	1,340,371	0.071	0.257	0.000	1.000
Common language$_{US,\ell}$	1,340,371	0.235	0.424	0.000	1.000
Common legal origin$_{US,\ell}$	1,340,371	0.263	0.440	0.000	1.000
Linguistic distance$_{US,\ell}$	1,340,371	0.906	0.149	0.352	1.000
Freight costs$_{US,\ell}$	1,340,371	1.080	0.027	1.019	1.181
log(GDPpc)$_{\ell t}$	1,340,371	9.681	0.887	6.062	11.28
log(GDP)$_{\ell t}$	1,340,371	13.14	1.344	8.680	16.27
Rule of law$_\ell$	1,340,371	0.690	0.935	-1.791	1.943
Trust$_\ell$	1,340,371	0.634	0.317	0.079	1.48
Industry/country variation of cultural distance:					
Intra-firm import share, $IFIS_{i\ell t}$	22,674	0.338	0.285	0.000	1.000
Cultural distance$_{i\ell}^{(1)}$	22,674	0.229	0.189	0.000	0.690
Cultural distance$_{i\ell}^{(2)}$	22,674	0.200	0.164	0.000	0.636
Cultural distance$_{i\ell}^{(3)}$	22,674	0.202	0.166	0.003	0.639
Capital interaction$_{i\ell t}$	22,674	52.25	9.114	23.18	87.55
Skill interaction$_{i\ell t}$	22,674	-3.633	1.233	-7.864	-0.693
Institutional distance$_{i\ell}$	22,674	0.008	0.006	0.000	0.030
Firm-pair variation of cultural distance:					
O_{hs}^{maj}	15,857	0.621	0.485	0.000	1.000
$O_{hs}^{\%}$	15,857	0.620	0.396	0.001	1.000
Cultural distance$_{hs}$ (Individualism)	15,857	0.029	0.072	0.000	0.700
log(K/L)$_{i\ell_s}$	15,857	3.769	1.277	-0.294	10.51
log(Employment)$_s$	15,857	4.624	1.942	0.000	12.73
log(Revenue)$_s$	15,857	9.941	2.293	2.302	19.92
Cultural distance$_{hs}$ (PDI)	15,857	0.034	0.085	0.000	0.890
Cultural distance$_{hs}$ (UAI)	15,857	0.037	0.086	0.000	0.720
Cultural distance$_{hs}$ (MAS)	15,857	0.037	0.089	0.000	0.860
Cultural distance$_{hs}$ (LTO)	15,857	0.032	0.075	0.000	0.670
Cultural distance$_{hs}$ (HAR)	15,857	0.059	0.133	0.000	1.340
Cultural distance$_{hs}$ (EMB)	15,857	0.043	0.103	0.000	1.320
Cultural distance$_{hs}$ (HIE)	15,857	0.062	0.147	0.000	2.000
Cultural distance$_{hs}$ (MST)	15,857	0.022	0.051	0.000	0.625
Cultural distance$_{hs}$ (AAU)	15,857	0.074	0.169	0.000	1.400
Cultural distance$_{hs}$ (IAU)	15,857	0.052	0.115	0.000	1.040
Cultural distance$_{hs}$ (EGA)	15,857	0.047	0.116	0.000	0.983

	Dependent variable: Intra-firm import share, $IFIS_{i\ell t}$				
	(1)	(2)	(3)	(4)	(5)
Panel A.					
Cultural distance$_{i\ell}^{(2)}$	-0.458***	-0.325***	-0.384**	-0.569***	-0.590***
	(0.030)	(0.125)	(0.175)	(0.206)	(0.208)
Cultural distance$_{i\ell}^{(2)}\times\log(K/L)_i$				0.057*	0.055*
				(0.032)	(0.032)
Capital interaction$_{i\ell t}$					0.028*
					(0.015)
Skill interaction$_{i\ell t}$					-0.024
					(0.042)
Institutional distance$_{i\ell}$					3.637
					(5.917)
Observations	23,055	22,998	22,942	22,942	22,674
R^2	0.069	0.375	0.414	0.414	0.412
Panel B.					
Cultural distance$_{i\ell}^{(3)}$	-0.448***	-0.317***	-0.378**	-0.539***	-0.552***
	(0.030)	(0.122)	(0.167)	(0.194)	(0.196)
Cultural distance$_{i\ell}^{(3)}\times\log(K/L)_i$				0.053*	0.051*
				(0.031)	(0.031)
Capital interaction$_{i\ell t}$					0.028*
					(0.015)
Skill interaction$_{i\ell t}$					-0.025
					(0.042)
Institutional distance$_{i\ell}$					3.331
					(5.887)
Observations	23,055	22,998	22,942	22,942	22,674
R^2	0.067	0.375	0.414	0.414	0.412
Country/Year FE	no	yes	yes	yes	yes
Industry FE	no	yes	yes	yes	yes
Industry dummies$\times\log(GDPpc)_{\ell t}$	no	no	yes	yes	yes
Industry dummies$\times Rule_\ell$	no	no	yes	yes	yes

Notes: The table reports OLS estimates of equation (17), with *Cultural distance*$_{i\ell}^{(2)}$ and *Cultural distance*$_{i\ell}^{(3)}$ as explanatory variables in panels A and B, respectively. See text for details on the definition of variables. The R^2 reports the goodness of fit averaged across the two panels. Robust standard errors are clustered at the industry/country level and presented in parentheses. ***, **, * denote 1, 5, 10 % significance, respectively.
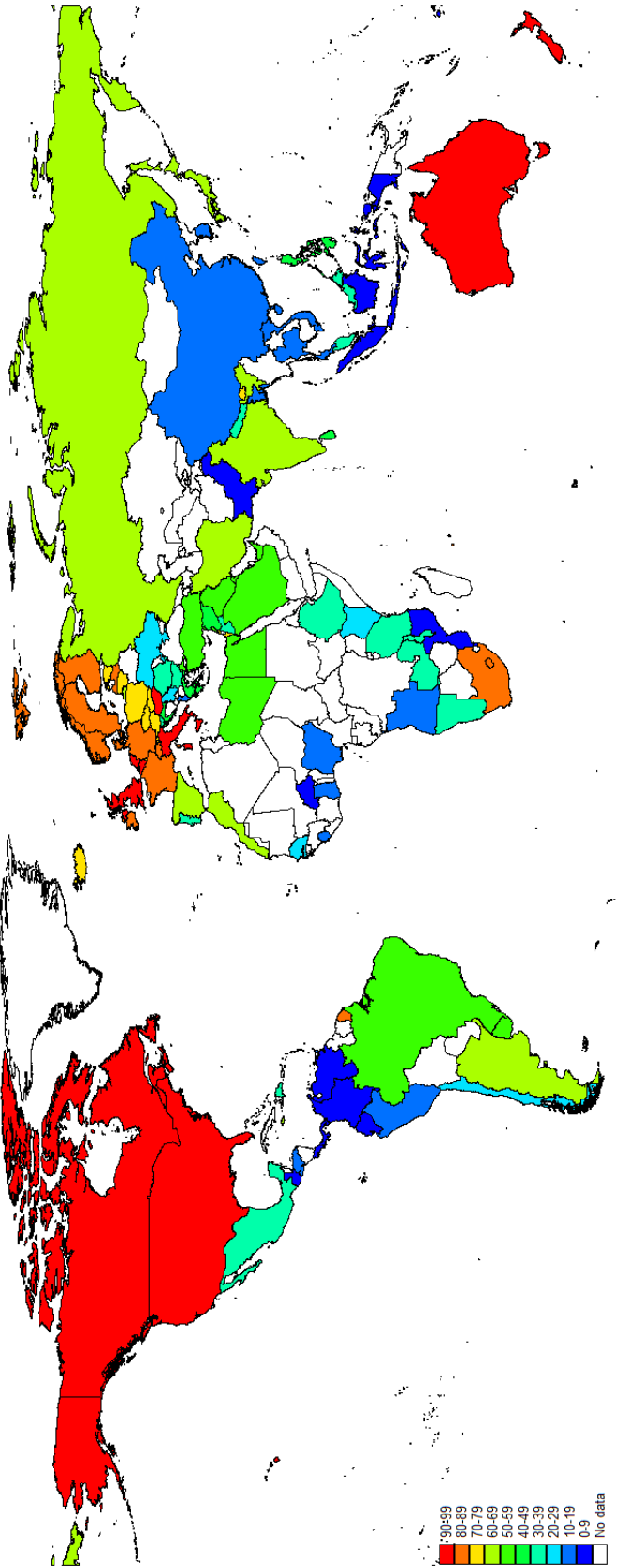
The Distribution of Hofstede's Individualism Scores.

Notes: The scores are publicly available at: http://www.geerthofstede.eu.