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CULTURE AND GLOBAL SOURCING

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ABSTRACT

This paper develops a model of global sourcing with culturally dissimilar countries. Production of final goods requires the coordination of decisions between the headquarter of a multinational firm and managers of their component suppliers. Managers of both units are assumed to have strong beliefs about the right course of action and are reluctant to adjust their decisions. We characterize the optimal allocation of decision rights across firms when contracts are incomplete. Our theoretical model delivers two key predictions: the incentive of a firm to integrate (rather than outsource) its input supply is decreasing in the cultural distance between the home and the host country and decreasing in trade costs between the two countries. Combining data from the U.S. Census Bureau's Related Party Trade with various measures for cultural distance and trade cost, we find empirical evidence strongly supportive of these two predictions.

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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 communication have become indispensable components of most (if not all) 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.

This paper aims at shedding light, both theoretically and empirically, on the effects of problems of cultural communication across countries on the organization of global sourcing. In particular, we investigate how national cultural distance, defined as the extent to which the shared values and norms in one country differ from those in another, affects the managerial decision whether to integrate a foreign supplier into a multinational firm's boundaries or to cooperate with the latter at arm's length. The basic trade-off analyzed in this paper is as follows: Integration leads to a better coordination of decisions across firm units and a higher monetary payoff to the headquarter manager, but is associated with a loss in the latter's non-monetary job satisfaction as a result of frictions within the integrated firm. Given that these frictions are likely to be amplified by managerial cultural differences, this paper argues that the prevalence of integration decreases in the cultural distance between countries.

It is particularly interesting to study the effect of culture in the context of multinational enterprises rather than that of exporting or importing firms, for two reasons. First, since a multinational firm "controls and manages production establishments (plants) located in at least two countries" (Caves 2007: 1), managers of multinational firms are inevitably confronted with the issue of cross-cultural collaboration. Second, multinational firms play a major role in the global economy. According to the UNCTAD (2011) World Investment Report, multinational enterprises account for one-quarter of world GDP. Roughly one-third of the volume of world trade is intra-firm trade. Moreover, roughly another third of world trade is accounted for by transactions in which multinational firms are one of the two sides of the exchange, see UNCTAD (2000).[1]

Culture is generally defined as the set of values and beliefs, which are shared by a com-

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

munity and are persistent over time. There is by now a rapidly expanding literature (see, e.g. Fernandez et al. 2004, Fernandez 2010, Guiso et al. (2003, 2006, 2009), Gorodnichenko and Roland (2010, 2011), Tabellini (2008, 2010), Alesina et al. 2013, Alesina and Giuliano 2015), analyzing the impact of culture on various economic outcomes. Yet, to the best of our knowledge, the impact of culture on the organization of multinational firms and on their outsourcing decisions has not been explored in the economics literature.

To address our research question, we need a theory of a multinational firm's boundaries that incorporates frictions between managers of different cultures. We build on the recent theory of the firm by Hart and Holmström (2010). Their approach moves the focus away from the canonical property rights theory by Grossman and Hart (1986) and Hart and Moore (1900) – which emphasizes the role of non-human assets in determining a firm's boundaries – towards a theory that highlights the role of managers in making strategic coordination decisions across firm units. A key feature of their approach is the assumption that managers enjoy two kinds of benefits: monetary profits and private non-monetary benefits (or job satisfaction). The latter benefits are usually modeled as exogenous parameters. Instead, we endogenize job satisfaction in our model and assume that it depends negatively on the frictions created by the cultural distance between cooperating managers.[2]

On that basis, we develop a theoretical model of global sourcing that features vertical fragmentation of the production process as in Antràs and Helpman (2004), firm heterogeneity along the lines of Melitz (2003), and cross-country heterogeneity with regard to national cultural values. Production of final goods requires cooperation of two units: headquarters and manufacturing suppliers, which provide headquarter services and manufacturing components, respectively. Each unit is led by a single owner-manager, who is in charge of coordinating strategic decisions (e.g., technological standards or the degree of relationship-specificity of inputs) across units. It is assumed that managers of both units have strong beliefs about the right course of action and these beliefs differ. Hence, from a managerial perspective, coordination of decisions across units is associated with a fundamental trade-off. On the one hand, better coordination leads to a higher quality of final goods and larger managerial profits. On the other hand, deviation from one's most preferred vision and convergence towards the decision of the cooperation partner reduces a manager's non-monetary job satisfaction. The decision-making process crucially depends on the firm's organizational form. If the two units are not integrated, each unit's manager makes strategic decisions

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

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

How do we introduce culture in the model? The decision by the headquarter manager whether to source components from an independent or from an integrated supplier depends on the effect of cross-cultural communication on his private non-monetary benefits. We show that component suppliers are more likely to be integrated into firm boundaries when their cultural distance to the headquarters is smaller. Intuitively, as cultural distance increases, it becomes increasingly hard for a manager of an integrated firm to enact his most preferred decisions in a supply unit. If the associated loss in non-monetary job satisfaction outweighs the monetary benefit of integration stemming from better coordination of decisions, the headquarter manager may decide to cooperate with the supplier at arm's length.

Apart from this central finding, our model delivers the following three results. First, we show that better coordination of strategic decisions under integration results in a higher quality of final goods as compared to outsourcing. Second, the higher the firm's productivity the more likely managers of multinational firms are to integrate their suppliers into the firm rather than cooperating with them at arm's length. The intuition behind this result lies in the supermodularity of profits in productivity and final goods quality. Since higher productivity allows firms to reap higher profits, headquarter managers get a greater incentive to increase the quality of final goods by bringing their suppliers inside the firm's boundaries. Third, the higher the trade costs between the two countries the less likely a foreign supplier is to be integrated. This result is driven by the submodularity of profits in variable trade cost and final goods quality. Intuitively, higher trade costs decrease operating profits and, thereby, reduce the marginal gain from improving the final goods quality. As a result, the incentive to enhance coordination across units by integrating a supplier decreases.

All three above-mentioned theoretical propositions find strong empirical support. First, there is a broad consensus in the business literature that integration of an independent supplier into the firm boundaries increases the quality of goods or services. The Deloitte (2012) Global Outsourcing and Insourcing Survey reports unsatisfactory quality to be the

the major factor in the decision to terminate an existing arm's-length relationship. Moreover, almost all of the surveyed firms that switched from outsourcing to integration were satisfied with the result in terms of improved quality.[3] Second, using firm-level data, several studies have shown that firms engaged in foreign vertical integration appear to be more productive than those undertaking foreign outsourcing (see Corcos et al., 2013 for France; Kohler and Smolka, 2009 for Spain, and Tomiura, 2007 for Japan). Third, Antràs (2015) and Corcos et al. (2013) provide supportive evidence for our hypothesis of a negative effect of trade costs on integration.

Yet, our central result – the effect of cultural distance on the international make-or-buy decision – has not been empirically analyzed. We bring this prediction to the data by studying the sourcing decisions of U.S. firms. Following Nunn and Trefler (2008, 2013), we use as dependent variable U.S. intra-firm imports as a share of total U.S. imports from the U.S. Census Bureau's Related Party Trade dataset.[4] A high share of intra-firm imports reflects a greater willingness of US firms to obtain an ownership or control stake in foreign suppliers instead of buying intermediate goods at arm's length. Our key explanatory cultural variable is Hofstede's (2001) well-known individualism-collectivism index, generally considered to be the main dimension of cultural variation across countries (see, e.g., Heine, 2007). As the US is the most individualistic country according to Hofstede's measurement, and since we are looking at cultural distance between the US and its trade partners, the individualism-collectivism index provides a convenient measure of cultural distance. We find indeed that there is a negative and significant relationship between a country's cultural distance to the US and the share of intra-firm imports in total U.S. imports from this country, using a wide range of control variables.

While it is quite plausible that cultural distance affects decisions to integrate firms, it may also be the case, albeit to a lesser extent, that the presence of US firms in a country reduces cultural distance with managers working in those US firms. It may even be the case that a large presence of US firms in a country may reduce cultural distance between that country and the US. In order to infer a *causal* effect of cultural distance, we then follow two alternative identification strategies. First, we apply instrumental variables approach, whereby cultural distance is instrumented by the genetic distance between the population

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

[4] Given that comprehensive firm-level data on integration decisions is not readily available, this product-level dataset has been extensively used in the empirical literature to study international make-or-buy decisions, cf. Antràs (2013, 2015).

in a given country and the population in the U.S., as in Gorodnichenko and Roland (2011).[5] Given that genetic distance is exogenous to the firms' make-or-buy decisions, our instrument satisfies the exclusion restriction. Second, we construct an alternative measure for cultural distance based on ethnic composition of U.S. industries. 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 uses weights to compute industry-specific cultural scores. Both identification strategies confirm the negative impact of cultural distance on intra-firm imports found in simple linear regressions.

Related literature. From a theoretical perspective, our paper is closely related to the seminal contribution by Antràs and Helpman (2004), who study the international make-or-buy decision in a framework with monopolistic competition, contractual incompleteness, and firm-level heterogeneity. Their framework is centered on the property rights approach along the lines of Grossman and Hart (1986) and Hart and Moore (1990). In contrast, we emphasize the effect of cultural distance between managers on the internalization decision, and our framework borrows from Hart and Holmström's (2010) theory of the firm.[6] To be clear, the findings of our paper do not contradict but rather complement the results by Antràs and Helpman (2004). Moreover, our empirical analysis suggests that these two alternative explanations of multinational firms' boundaries simultaneously hold. We return to this issue in the conclusion.

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

[5] The choice of U.S. as a benchmark country is motivated by the fact that U.S. happens to be the most individualistic country in Hofstede's dataset.

[6] Conconi et al. (2012) and Legros and Newman (2013) introduce Hart and Holmström's (2010) theory to the context of international trade in order to study the effect of liberalization of product and factor markets on the organization of the firms. Both the focus and the approach of the current paper, however, are different. Our aim is to understand the effect of cultural distance on the international make-or-buy decisions of multinational firms.

distance on the international make-or-buy decision.

By putting managers into the center of our analysis, this paper is also related to the empirical literature that studies the impact of managerial effort on firm and economy-wide performance. Several empirical studies have shown a causal effect of successful managerial practices on firm performance (see, e.g., surveys by Bloom and Van Reenen 2010, Gibbons and Roberts 2013, and Syverson 2011). In a recent empirical study, Bloom et al. (2013) also find that cross-country differences in managerial practices may explain a substantial fraction of heterogeneity in total factor productivity across nations. Yet, there is a large consensus in the sociological literature that managerial behavior itself is a function of a country's cultural values (see, e.g., Sagiv et al., 2010 for an overview of this literature). We relate these two independent literature strands by showing how cultural differences shape managerial behavior and, thereby, affect both a firm's performance and the attractiveness of countries from the viewpoint of international investors.

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

2 Set-up

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

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

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

where z_i denotes consumption of a homogenous numeraire-good, X is an index of aggregate consumption of differentiated varieties $v \in V$, and μ is a parameter governing the intensity of preferences for differentiated goods. Aggregate consumption of differentiated varieties has the following form:

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

whereby $x(v)$ and $q(v)$ denote, respectively, the quantity and quality of differentiated varieties and $\sigma > 1$ represents the elasticity of substitution between any two varieties.

As will be shown further below, these non-homothetic preferences imply a linear relationship between consumer's income and utility. Following Hart and Holmström (2010), we assume that managers derive their utility not only from the monetary payoff but also from a non-monetary job satisfaction.[7] This notion is reflected through $\mathbf{1}_{i=H,M}$, an indicator function which takes the value one if an individual i is a manager and zero otherwise, whereby H denotes a manager of a headquarter unit and M represents a manager of a supplier firm (see below). The expression in parentheses denotes private job satisfaction. In the spirit of Hart and Holmström (2010), we subdivide this private benefit into two components: intrinsic, j_i^{int}, and extrinsic, j_i^{ext}.[8] The intrinsic component of job satisfaction stems from the pleasure a manager gets from working on the task itself and from the feeling of accomplishment, whereas its extrinsic component stems from the factors bestowed upon an individual by peers (e.g. a friendly working atmosphere, respect of co-workers etc.). Both components of the non-monetary job-satisfaction are assumed to enter a manager's utility function in a linearly additive way.[9] However, in our model, job satisfaction is endogenous. Functional forms for j_i^{int} and j_i^{ext} will be introduced below.

An individual's budget constraint reads $PX + z_i = Y_i$, where Y_i denotes an individual i's income, $P = \left(\int_{v \in V} p(v)^{1-\sigma} q(v) \mathrm{d}v \right)^{\frac{1}{\sigma-1}}$ is a quality-adjusted price index, where $p(v)$ is the price of variety $v \in V$. Standard utility maximization yields equilibrium demand functions for the homogeneous good, a bundle of differentiated varieties, and the inverse demand function for each differentiated variety, respectively:[10]

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

Plugging these results back in (1), we obtain an individual's indirect utility:

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

7 Although we confine our analysis of non-monetary benefits strictly to managers, our model can be extended so as to incorporate employees' job satisfaction as well.

8 This conceptualization is widely used in organization science, see e.g., Naumann (1993a), Staw (1989).

9 In fact, this is a standard working assumption in the organizational literature, cf. Naumann (1993b).

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

where $\kappa \equiv \mu \ln P - \mu(\ln \mu - 1)$ summarizes all terms that are constant across individuals. Throughout the analysis, W_i will be used as the welfare function of a manager $i = H, M$.

Production. The traditional good is produced in all countries under constant returns to scale and perfect competition. This good will be chosen as the numéraire. Production of one unit of output requires a^N units of labor in the home country and $a^l < a^N$ labor units in the foreign country (i.e. workers in N are assumed to be more productive than in any foreign country ℓ). This numéraire good is assumed to be costlessly traded, implying the same unit price in all regions. Consequently, the model exhibits a constant wage differential between the home country and foreign destinations: $w^N > w^\ell$. For simplicity, we normalize the wage rate in N to unity, $w^N = 1$.

Production of differentiated varieties exhibits monopolistic competition, whereby each variety is produced by a single firm under increasing returns to scale. As in Melitz (2003), firms are heterogeneous with respect to the productivity. To start the production of a variety v, a headquarter firm has to bear a fixed cost of entry, consisting of f_E units of local labor. Upon paying these fixed costs, the firm draws a productivity level θ from a known distribution function $G(\varphi)$. After θ is revealed, the headquarters decide whether to exit the market or start producing. Production of final goods requires the cooperation of two units: the headquarter firm and manufacturing suppliers. Each unit is operated by a single owner-manager. The manager of the headquarter and manufacturing unit will be referred to as H and M, respectively. Headquarter units specialize in the provision of headquarter services h, while supply units provide manufacturing components m. Inputs h and m are produced with a unit labor input requirement each. These inputs are combined into final goods according to the following Cobb-Douglas production function:

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

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

As mentioned above, we assume that all headquarters are located in the home country, whereas manufacturing suppliers are located in foreign countries.[11] After manufacturing components have been produced, they are shipped to N for final assembly, (see equation

[11] Our framework can be easily extended to the case in which manufacturing units are located both in home and foreign countries and headquarters decide between domestic and foreign sourcing, cf. Antràs and Helpman (2004). However, given that we do not observe this internationalization margin in the dataset used in the subsequent empirical analysis, we rule out domestic sourcing at the outset.

(5)). Transportation of manufacturing inputs from country ℓ to N involves iceberg-type trade cost τ^{ℓ}, which may differ across locations ℓ due to differences in distance and/or trade barriers.

In contrast to Antràs and Helpman (2004), we assume that parties can write enforceable contracts on the *quantity* of inputs h and m. This assumption is made to eliminate the well-known channel of inefficiencies stemming from the ex post hold-up and the associated ex ante underinvestment in inputs. Yet, we assume that the final-goods *quality* cannot be verified by the courts. In our model, the quality of final goods depends on the managerial coordination of strategic decisions across units (e.g., adoption of a common technological standard or platform). For simplicity, we normalize the set of possible coordination decisions to a unit interval and denote by $\alpha \in [0,1]$ decisions made in the headquarters' unit and by $\beta \in [0,1]$ decisions implemented in the manufacturing firm.

Managers H and M are assumed to have differing visions about the right course of action. More specifically, H prefers α to be as high as possible, while M prefers the smallest possible β. This assumption can be rationalized by invoking the issue of relationship-specificity: While final good producers might seek to adopt a specific production technology (e.g., to set themselves apart from competitors), manufacturing suppliers prefer to operate under a general technology (which would increase their outside option and/or allow them to serve multiple final good producers). For production to be efficient, it does not matter which particular decisions are chosen in both units, as long as these decisions are perfectly coordinated across firms. We thus assume the quality function takes the following form:

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

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

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

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

Apart from the non-monetary intrinsic cost from cooperation, managerial job satisfaction also includes an extrinsic component, which stems from the factors bestowed upon an individual by peers. We assume that the ability of a manager to affect the other manager's job satisfaction crucially depends on the ownership structure of a firm. If the two units are not integrated, H choses α for the headquarter unit and M choses β for the manufacturing unit. Given that an arm's-length transaction amounts to a purchase of manufacturing inputs according to ex ante specified conditions, managers have a limited ability to affect each others extrinsic job satisfaction. For simplicity, we normalize both managers' extrinsic job satisfaction under outsourcing to zero. By integrating a manufacturing supplier into firm boundaries, however, H obtains residual control rights to make decisions in both units and M becomes H's subordinate. More specifically, H instructs the manager of an integrated manufacturing unit to choose a particular β in this unit and M must follow these instructions. However, to the extent the decision implemented in the manufacturing unit deviates from M's most preferred agenda ($\beta = 0$), M is aggrieved and can 'transfer the hurt back' to H by reducing the latter's extrinsic job satisfaction.[12] As before, we normalize the upper bound of headquarter manager's extrinsic job satisfaction to zero and capture H's extrinsic private cost under integration as follows:

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

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

We assume that the contracting parties agree in advance on the future division of surplus.[13] Both under integration and outsourcing, H and M stipulate the quantity of deployed inputs $\{h, m\}$ and the associated reward for workers producing these inputs. Furthermore, managers stipulate ex ante the surplus sharing rule: Under outsourcing, the headquarter manager H obtains a share $s \in (0, 1)$ of the operating profit, whereas the remaining share $(1 - s)$ accrues to the manager M of the manufacturing firm. For simplicity, we assume that these shares are identical for all H and M. Under integration, H diverts the entire operating profit and compensates M with a fix wage ω.

Headquarters that have drawn their productivity θ and decided to start a production

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

[13] In view of the fact that most, if not all, real-world commercial contracts include (some kind of) specification for future compensation, this assumption seems realistic.

face the following timing of events:

- t_1 Each H decides whether to outsource manufacturing production to an independent producer or to integrate a supplier into the firm's boundaries. H contractually commits to compensate M with a fraction $(1-s) \in (0,1)$ of a joint operating profit in the former case and a fixed wage ω in the latter.

- t_2 Under outsourcing, H chooses α, while M chooses β. Under integration, H chooses both α and β.

- t_3 H stipulates the quantity of inputs h and m. Inputs are produced and combined into final goods according to the production technology from equation (5).

- t_4 The resulting output is sold and the revenue is distributed among the parties according to the sharing rule specified at t_1.

3 Equilibrium

We solve this game through backward induction. The revenue from the sale of the final goods is $R = px$, which, using (3), (5), and (6) can be written as

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

The associated joint operating profit is:

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

Consider first the case of outsourcing, which we index by O. At t_4, this operating profit is divided between two firms according to the sharing rule specified ar t_1, i.e. H receives $s\Pi^{\ell}$, whereas M obtains $(1-s)\Pi^{\ell}$. Anticipating this outcome, H chooses at t_3 the quantity of inputs $\{h, m\}$ that maximize his welfare $W_H = s\left[R - h - \tau^{\ell} w^{\ell} m\right] + j_H^{int} - \kappa$, whereas R is given by (9).[14] This maximization problem yields equilibrium input quantities $h = \eta \frac{\sigma-1}{\sigma} R$ and $m = (1-\eta)\frac{\sigma-1}{\sigma}\frac{R}{\tau^{\ell} w^{\ell}}$. Plugging these quantities back in (10) yields joint operating profit for any tuple $\{\alpha, \beta\}$:

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

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

where firm-specific productivity $\Theta \equiv \theta^{\sigma-1}$ has been redefined for notational simplicity and

$$B^{\ell} \equiv (\tau^{\ell} w^{\ell})^{-(1-\eta)(\sigma-1)} \frac{\mu}{\sigma} \left(\frac{\sigma-1}{\sigma}\right)^{\sigma-1} P^{\sigma-1} \tag{12}$$

summarizes all terms that are constant across firms that source m from a given location ℓ.

Managers anticipate Π^{ℓ} and make at t_2 coordination decisions that maximize their welfare. More specifically, H chooses α to maximize $W_H^{O\ell}$:

$$\max_{\alpha} W_H^{O\ell} = s(1-(\alpha-\beta)^2)\Theta B^{\ell} - (1-\alpha)^2 - \kappa, \tag{13}$$

while M chooses β to maximize $W_M^{O\ell}$:

$$\max_{\beta} W_M^{O\ell} = (1-s)(1-(\alpha-\beta)^2)\Theta B^{\ell} - \beta^2 - \kappa. \tag{14}$$

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

$$\alpha_O^{\ell} = \frac{1+(1-s)\Theta B^{\ell}}{\Theta B^{\ell}+1} \quad , \quad \beta_O^{\ell} = \frac{(1-s)\Theta B^{\ell}}{\Theta B^{\ell}+1}. \tag{15}$$

It can immediately be seen from (15) that $\alpha_O^{\ell} > \beta_O^{\ell}$, i.e., strategic decisions are not perfectly coordinated across units. As a result, the quality of final goods under outsourcing

$$q_O^{\ell} = \frac{\Theta B^{\ell}(\Theta B^{\ell}+2)}{(\Theta B^{\ell}+1)^2} \tag{16}$$

is below its maximum level for all possible parameter values, i.e. $q_O^{\ell} < 1$.[15] Plugging (15) in (13), we obtain H's equilibrium welfare under outsourcing:

$$W_H^{O\ell} = \frac{s(\Theta B^{\ell})^2(\Theta B^{\ell}+2-s)}{(\Theta B^{\ell}+1)^2} - \kappa. \tag{17}$$

Consider next the case of integration, indexed by I. The manager of the integrating firm (H) diverts the entire operating profit and compensates the manager of the integrated firm (M) with a fixed wage ω. At t_4, H maximizes his welfare $W_H = R - h - \tau^{\ell} w^{\ell} m - \omega + j_H^{int} + j_H^{ext} - \kappa$ by choosing the equilibrium input quantities $h = \eta\frac{\sigma-1}{\sigma}R$ and $m = (1-\eta)\frac{\sigma-1}{\sigma}\frac{R}{\tau^{\ell} w^{\ell}}$. As before, the resulting joint operating profit, $\Pi^{\ell} = (1-(\alpha-\beta)^2)\,\Theta B^{\ell}$ is a function of equilibrium decisions $\{\alpha, \beta\}$. Yet, in contrast to outsourcing, H now has the right to make strategic decisions in both units. Bearing in mind the extrinsic private cost from instructing

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

M, see (8), H's maximization problem at t_2 is given by:

$$\max_{\alpha,\beta} W_H^{I\ell} = (1-(\alpha-\beta)^2)\Theta B^\ell - (1-\alpha)^2 - c^\ell \beta^2 - \omega - \kappa. \tag{18}$$

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

$$\alpha_I^\ell = \frac{\Theta B^\ell + c^\ell}{\Theta B^\ell(1+c^\ell)+c^\ell} \quad , \quad \beta_I^\ell = \frac{\Theta B^\ell}{\Theta B^\ell(1+c^\ell)+c^\ell} \,. \tag{19}$$

It can immediately be seen that $\beta_I^\ell < \alpha_I^\ell < 1$. This means that although H now possesses decision rights in both units, strategic decisions under integration are not perfectly coordinated. Intuitively, H internalizes the loss in job satisfaction from instructing M but does not insist on his most preferred outcome, $\beta_I^\ell = \alpha_I^\ell = 1$ because of the cost c^ℓ associated in imposing his position on the foreign manager. As a result, the quality of final goods under integration

$$q_I^\ell = \frac{\Theta B^\ell(1+c^\ell)(\Theta B^\ell(1+c^\ell)+2c^\ell)}{(\Theta B^\ell(1+c^\ell)+c^\ell)^2} \tag{20}$$

is as well below the maximum level, $q_I^\ell < 1$.[16] However, a simple comparison of (20) and (16) yields

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

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

Intuitively, the authority to make decisions in both units under integration allows H to achieve better coordination compared to an arm's-length relationship and, thereby, improve on the final goods quality.

Plugging (19) in (18), we obtain H's welfare under integration:

$$W_H^{I\ell} = \frac{(\Theta B^\ell)^2(1+c^\ell)}{\Theta B^\ell(1+c^\ell)+c^\ell} - \omega - \kappa. \tag{21}$$

At t_1, a headquarter manager anticipates this outcome and compares it with his welfare under outsourcing. H thus decides in favor of integration if and only if $W_H^{I\ell} - W_H^{O\ell} > 0$. Using (17) and (21), this condition can be written as:

$$\Omega^\ell(c^\ell,\tau^\ell) \equiv \frac{(\Theta B^\ell)^2(1+c^\ell)}{\Theta B^\ell(1+c^\ell)+c^\ell} - \frac{s(\Theta B^\ell)^2(\Theta B^\ell+2-s)}{(\Theta B^\ell+1)^2} > \omega. \tag{22}$$

It can immediately be seen that $\Omega^\ell|_{\Theta=0} = 0 < \omega$. That is, managers of headquarter firms

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

with the lowest productivity strictly prefer outsourcing to integration. It can also be shown that $\lim_{\Theta\to\infty}\Omega^\ell = \infty$ for all parameter values, i.e., firms with highest productivity strictly prefer integration to outsourcing. Finally, we prove in Appendix A.1 that $\Omega^\ell(\cdot)$ is increasing in Θ.

Lemma 2. As long as ω is finite and Θ has positive support over $(0,\infty)$, there exits a unique productivity cutoff $\hat{\Theta}$ such that final good producers with productivity below $\hat{\Theta}$ engage in outsourcing, while those with productivity above this cutoff integrate their suppliers into firm boundaries.

Proof. See Appendix A.1.

The intuition behind this Lemma lies in the supermodularity of profits in productivity and final goods quality (see equation (11)). An improvement in final goods quality leads to a larger increase in profits the higher a firm's productivity. Since H's welfare is a function of the firm's profits, managers of more productive firms have the highest incentive to increase the quality of final goods by integrating manufacturing suppliers into firm boundaries.

Apart from firm-specific productivity, a firm's integration decision also depends on two country-specific factors. A simple differentiation of (22) implies that Ω^ℓ is decreasing in c^ℓ. We thus have

Proposition 1. Final good producers are more likely to integrate their foreign suppliers into the firm's boundaries instead of cooperating with them at arm's-length if the cultural distance between the two countries is lower.

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

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

Furthermore, the internalization decision depends on the trade cost between ℓ and N. We show in Appendix A.2 that Ω^ℓ is decreasing in τ^ℓ. This implies

Proposition 2. The lower trade cost between the two countries the more final goods producers are likely to integrate their foreign suppliers into the firm's boundaries instead of cooperating with them at arm's-length.

Proof. See Appendix A.2.

The intuition behind this result relates to the fact that profits are submodular in trade cost τ^ℓ and final goods quality (see (11) and (12)). In other words, as trade costs decrease, the marginal increase in firm's profits due to an improvement of final goods quality increases.

Given that H's welfare is a function of the firm's profits, the incentive of the headquarter manager to improve upon the quality of final goods by integrating a manufacturing suppliers increases.

4 The Empirical Analysis

4.1 Data

To test the predictions of our theoretical framework, we pool together several datasets. To measure the extent to which multinational firms integrate their foreign supplies rather than cooperate with them at arm's-length, we use the "U.S. Related Party Trade" product-level data collected by the U.S. Bureau of Customs and Border Protection.[17] As discussed in Antràs (2013, 2015), this data is one of the most frequently used in the analysis of the international make-or-buy decision. The database contains 390 manufacturing industries for 232 countries from 2000-2011.[18] As a measure of vertical integration, we use U.S. intra-firm import share, defined as the ratio of related-party imports to the sum of related and non-related imports. A related-party import is defined 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". Because this dataset covers only U.S. firms, our analysis is U.S. centered.

The second key ingredient in our analysis is a measure of cultural differences across countries. We use cultural indices constructed by Geert Hofstede, initially for about 30 countries in the early 1970s and later extended to cover more than 90 countries. Hofstede initially identified four key dimensions of culture: individualism vs. collectivism, uncertainty avoidance, power distance (strength of social hierarchy), and masculinity-femininity (task orientation versus person-orientation). Since the cross-cultural psychology literature views the individualism-collectivism cleavage as the main cultural difference across countries (see Heine, 2008), our baseline analysis focuses on this cultural dimension, but we report results for additional dimensions in Appendix B.[19] Figure 2 presents the map of individualism scores. Conveniently, the U.S. is the country with the highest individualism score. The

[17] The data is drawn from the dataset compiled and made publicly available by Pol Antràs on his homepage: http://scholar.harvard.edu/antras/books

[18] Sectoral disaggregation is at the six-digit level as given by the North American Industry Classification System (NAICS).

[19] Gorodnichenko and Roland (2011) find that, among a variety of cultural dimensions, including the other Hofstede measures, the individualism-collectivism dimension is the most important and robustly significant explanatory factor of long run growth.

cultural distance of country ℓ to the U.S. is then given by $Culturaldistance_{\ell} = |I_{\ell} - I_{US}|$, where I_{ℓ} is the individualism score of country ℓ. We thus examine whether cultural distance between countries affects U.S. intra-firm import shares across countries.

Industries in the U.S. are, however, heterogeneous in their exposure to foreign markets, organization of foreign production (i.e., integration vs. arm's-length), and ethnic composition of their managers. To enhance our identification, we construct a measure of cultural distance at the industrial level between a given country and the U.S. More specifically, we use information on the ancestry of U.S. citizens from the 2000 U.S. Census to estimate 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. Since our theoretical model emphasizes the effect of cultural distance on the managerial make-or-buy decisions, our baseline measures for cultural composition of a sector include only those individuals who indicated their occupation as 'Manager' or 'C.E.O'.[20] Having calculated the ethnic shares of managers in a given industry, we weigh them with the individualism levels of their ancestor's country of origin to obtain industry-specific individualism scores:

$$I_{US,s} = \sum_{\ell} \Omega_{\ell s} I_{\ell}, \tag{23}$$

where $\Omega_{\ell s}$ is the share of ethnic group ℓ in industry s. The cultural distance between a trading partner p and the U.S. for industry s is thus given by $Culturaldistance_{p,s} = |I_p - I_{US,s}|$.

We consider 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 of trade. First, we consider only those managers who report their ancestry, and define the associated cultural distance as $Culturaldistance^{(1)}_{p,s} = |I_p - I^{(1)}_{US,s}|$. For the second measure, we assign the average U.S. individualism score to all respondents of the U.S. Census who do not report their ancestry, $I^{(2)}_{US,s} = \sum_{\ell} \tilde{\Omega}_{\ell s} I_{\ell}$. We denote the corresponding distance $Culturaldistance^{(2)}_{p,s} = |I_p - I^{(2)}_{US,s}|$. The third measure is a modification of the first measure tailored to minimize the effects of missing values and 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 the U.S. and China for industry s, we use $I^{(3)}_{China,US,s} = \sum_{\ell:\ell \neq China} \breve{\Omega}_{\ell s} I_{\ell}$ to

[20] Our robustness checks show that the results continue to hold if we consider general employment rather than just managers.

compute cultural distance $Culturaldistance^{(3)}_{China,s} = |I_{China} - I^{(3)}_{China,US,s}|$.

To control for potentially confounding factors, we also use data from previous studies and other sources. We describe additional variables below.

4.2 Econometric Specification

Our baseline specification is as follows:

$$\begin{aligned} IFIS_{spt} =& a_0 \times Culturaldistance_{sp} + \gamma_p + \lambda_t \\ &+ b_0 \times \log(geodist)_p + b_1 \times FreightCosts_{sp} + b_2 \times Tariffs_{sp} \\ &+ b_3 \times \log\left(\frac{R\&D}{Sales}\right)_{sp} + b_4 \times \log\left(\frac{Capital}{Labor}\right)_{sp} + b_5 \times \log\left(\frac{Skilled}{Unskilled}\right)_{sp} \\ &+ b_6 \times ProductivityDispersion_{sp} + b_7 \times Elasticity_{sp} + \boldsymbol{b} \times \mathbf{X}_{sp} + error, \end{aligned}$$

where $IFIS$ is the U.S. intra-firm import share from the U.S. Bureau of Customs and Border Protection and s, p and t index sectors, trading partners, and years, respectively. $Culturaldistance_{sp}$ is the above-mentioned proxy for cultural distance, γ_p and λ_t are fixed effects for trading partners and years, respectively, and $\mathbf{X}$ is a vector of controls which we describe below.

The next three control variables are proxies for trade cost, included to test for our Proposition 2. *Log(geodist)* is drawn from Mayer and Zignago (2011) and denotes the log of a country's geographic distance to the US weighted by the geographic distribution of population inside each nation. *FreightCosts* are from Schott (2010) and are measured by the ratio of CIF imports to FOB imports for a given product and origin country for the period 2000-2005. *Tariffs* are U.S. tariffs from the World Integrated Trade Solution (WITS) maintained by the World Bank (for details, see data appendix in Antràs (2015)).

The inclusion of the next three control variables is motivated by the property rights Theory of the firm, i.e. Grossman and Hart (1986) and Antràs and Helpman (2004). According to this theory, the ownership rights should be assigned to the party that conducts the most important relationship-specific investment. Hence, in industries with a high headquarter intensity, headquarter firms are more likely to integrate their manufacturing producers and to source intermediate inputs within firm boundaries (implying a high intra-firm import share). The empirical literature on the property rights theory of the firm has suggested the following three proxies for the headquarter intensity (see, e.g., Nunn and Trefler (2008, 2013) and Antràs (2015)): *Log(R&D/Sales)* is a measure of Research and Development (R&D) intensity of an industry and is calculated as the the log of R&D expenditures divided by total sales; *Log(Capital/Labor)* is a proxy for capital intensity of an industry, measured as the log of the real capital stock per worker; *Log(Skilled/Unskilled)* is an industry's skill intensity, calculated as the log of the number of non-production workers divided by total employment. All three measures are available from Antràs (2015) at the 6-digit NAICS level.

The final two variables in our baseline specification are productivity dispersion and demand elasticity in the U.S. market. The inclusion of these two control variables is motivated by the theoretical work of Antràs and Helpman (2004). In their model, a higher productivity dispersion positively affects the share of intra-firm imports, since firms that integrate their foreign suppliers are more productive than firms that source foreign inputs at arm's length. Although we do not explicitly show the effect of productivity dispersion on the make-or-buy decision in the present model, our Lemma 2 is well-aligned with this prediction. Following Nunn and Trefler (2008, 2013) and Antràs (2015), we measure productivity dispersion as the standard deviation of the log of exports for a particular good across U.S. port locations and destination countries in 2000, using data from the U.S. department of Commerce. Similarly, elasticity of demand is likely to affect the revenue of firms and, thereby, the share of intra-firm imports. However, as shown by Antràs (2015), this effect is ambiguous. The measure of U.S. demand elasticity is drawn from Antràs (2015), who adapted these data from Broda and Weinstein (2006).

4.3 Empirical Analysis

As a first pass at the data, we plot the share of U.S. intra-firm imports aggregated at the country level against that country's cultural distance to the U.S. As shown in Figure 1, the correlation between these two measures is negative and highly significant. A country such as Pakistan, which has 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 over 40 percent of imports that are intra-firm.

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 results for our baseline econometric specification. We find that as we add more controls the coefficient on cultural distance does not really change. The estimated coefficient is a robust 0.28. This means that a standard deviation change in the level of individualism (22.13 points in the individualism index) is associated with a 6.4 percentage point change in the share of intra-firm imports. This is a significant magnitude since the average share of intra-firm imports in the data base we use is 19.92%. Furthermore, in accordance with Proposition 2, all three proxies for trade costs negatively affect the share of intra-firm trade, as can be seen in columns (2) to (5).

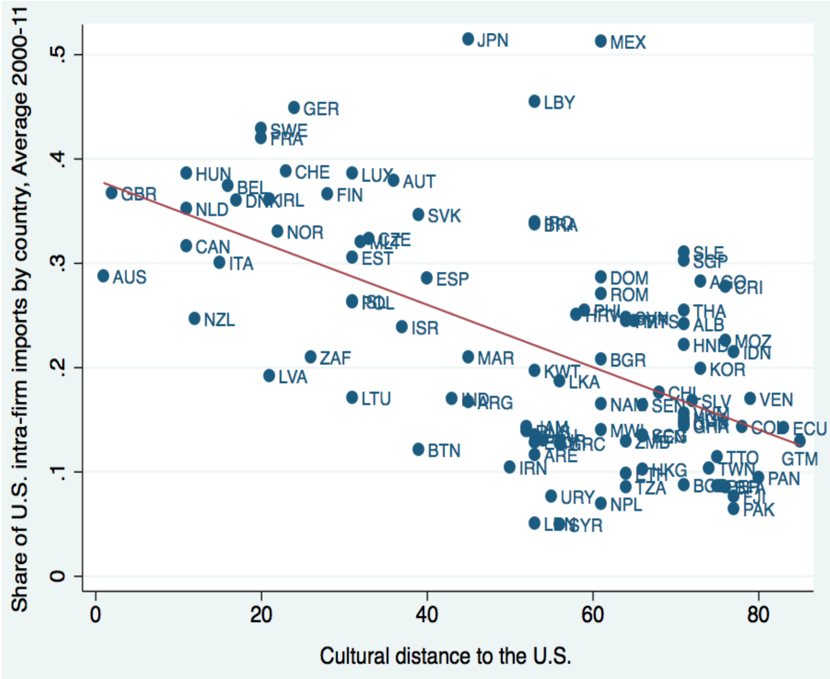

Figure 1: Cultural distance and the share of intra-firm imports by country.

Estimates for the control variables in columns (3) and (4) are broadly in line with previous empirical studies of global sourcing, (see, e.g., Chapter 8 in Antràs (2015)). As we see, *Log(R&D/Sales)* and *Log(Capital/Labor)* both have the predicted sign and are significant, while *Log(Skilled/Unskilled)* has the right sign but is insignificant. Importantly, comparing fit of the statistical model in columns (4) and (5), with and without cultural distance, suggests that cultural distance nearly doubles the R^2 and thus has considerable predictive power. This is an important result as it shows that culture is as important as property rights considerations in explaining outsourcing decisions of multinational firms.

While the baseline specification includes controls routinely used in global sourcing literature, one may be concerned that cultural distance can potentially pick variation of other factors related to culture. To address this concern, we include additional regressors that can simultaneously affect global sourcing and culture. First, in order to ensure that our results are not confounded by common religious values, we include the share of *Catholics* and *Protestants* in the population, taken from Barro (2003). Second, one could think that cultural proximity merely picks up the effect of a common language. Hence, we include a dummy variable equal to one if *English* is an official language of a partner country. This variable is drawn from Mayer and Zignago (2011). Third, the structure of trade and cultural attributes may be 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. To rule out this alternative

Table 1: *Determinants of U.S. Intra-firm Import Shares.*

	Dependent variable: $IFIS$				
	(1)	(2)	(3)	(4)	(5)
Cutural distance	-0.290***	-0.286***	-0.284***	-0.284***	
	(0.035)	(0.035)	(0.035)	(0.035)	
Log(geodist)		-0.056*	-0.055*	-0.055*	-0.057*
		(0.032)	(0.032)	(0.032)	(0.028)
Freight Costs		-1.068***	-0.784***	-0.797***	-0.807***
		(0.074)	(0.063)	(0.064)	(0.064)
Tariffs		-0.182***	-0.110***	-0.093***	-0.109***
		(0.027)	(0.022)	(0.021)	(0.021)
Log(R&D/Sales)			0.023***	0.023***	0.024***
			(0.002)	(0.002)	(0.002)
Log(Capital/Labor)			0.019***	0.020***	0.022***
			(0.004)	(0.004)	(0.004)
Log(Skilled/Unskilled)			0.001	0.003	0.004
			(0.006)	(0.006)	(0.006)
Productivity Dispersion				-0.005	-0.004
				(0.003)	(0.003)
Elasticity of Demand				-0.001***	-0.001***
				(0.000)	(0.000)
Observations	256,110	255,565	255,565	255,565	255,565
R^2	0.045	0.078	0.090	0.091	0.047

Note: The table reports estimates of OLS regressions. Robust standard errors are clustered at the country level and presented in brackets. ***, **, * denote 1, 5, 10 % significance.

explanation, we include the log of a country's GDP, *Log(GDP)*, as an additional regressor. We should note that while it has been shown that the level of income can affect the volume of trade between countries, we are not aware of models or empirical evidence linking the level of income to the structure of global sourcing. Fourth, Guiso et al. (2006) suggest that the level of trust can influence the volume of trade between countries. It is, however, not clear how differences in the level of trust between countries affect a firm's international make-or-buy decision. To tackle this question, we also control for the country's level of *Trust*, drawn from the World Values Survey. Finally, the correlation between make-or-buy relationship and culture may be driven by the volatility of the institutional environment. For example, poor and volatile institutions may be associated to a higher level of collectivism (e.g., it may be easier to survive as a group) and increased integration (e.g., it may be easier to avoid hold-up problems). To measure the stability of institutions, we use the ICRG's *Government Stability* score averaged over 1980s through 2000s.[21]

We find that including these additional controls does not alter our conclusions about the strength of the relationship between cultural distance and the structure of global sourcing, as can be seen from Table 2. The estimated coefficients on these additional variables may

[21] The International Country Risk Guide (ICRG) Government Stability score provides an assessment both of the government's ability to carry out its declared program(s), and its ability to stay in office. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of 0 points. A score of 4 points means Very Low Risk and a score of 0 points means a Very High Risk. The maximum score, based on the three subcomponents, is 12.

be interesting in their own right. For example, the U.S. multinationals are more likely to integrate their foreign affiliates in countries with a great share of Catholics and Protestants, having an official language other than English, a higher level of income, and more stable governments.

While including more regressors mitigates the omitted variables bias, we can make further steps to sharpen our conclusions. Specifically, we consider two additional identification strategies. First, we apply an instrumental variables approach. Second, we use variation of ethnic compositions across U.S. industries.

To implement the first strategy, we follow Gorodnichenko and Roland (2011) who use differences in the frequency of blood types across ethnic groups to quantify genetic distance between countries. Since blood type is a neutral genetic marker determined many centuries before the industrial revolution, this genetic marker is unlikely to have a direct effect on economic outcomes. Gorodnichenko and Roland (2011) document that blood distance is a strong predictor of cultural differences. Column (6) in Table 2 shows that using this IV reduces the size of the estimate (from -0.211 to -0.105) and, while the magnitude is economically significant, the estimated coefficient is not statistically different from zero. This reduction in the size of the coefficient is largely due to Mexico that has a very high intra-firm import share (because of NAFTA) but is culturally quite different (see figure 1). Once we exclude Mexico from the regression (column 7), the IV estimate of cultural distance becomes significant at the 5% level.

While these results are reassuring, they do not eliminate the possibility that there are confounding factors that vary at the level of the country. The standard practice is to include country fixed effects to address this issue. Unfortunately, we cannot implement this approach in the baseline specification because our cultural distance between countries does not vary across industries. However, as we discussed above, there is considerable variation in the ethnic composition of management across U.S. industries. We can thus construct country/industry-specific measures of cultural distance and use country and year fixed effects to attenuate the adverse effects of these confounding factors. This constitutes our second strategy.

Columns (1) through (3) in Table 3 show that using these alternative measures of cultural distance yields results similar to the baseline where we do not include country or year fixed effects. The coefficient is in general higher than with the country cultural distance. This is good news, because it tends to suggest that the cultural distance effect between managers is even larger than the estimate obtained when using country cultural distance. Note that the number of observations is different in Table 3 relative to Tables 1 and 2 as industry

Table 2: *Determinants of U.S. Intra-firm Import Shares.*

	Dependent variable: $IFIS$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cultural distance	-0.261***	-0.278***	-0.225***	-0.230***	-0.211***	-0.105	-0.163**
	(0.042)	(0.043)	(0.044)	(0.046)	(0.049)	(0.088)	(0.074)
Log(geodist)	-0.033	-0.031	-0.036	-0.037	-0.040	-0.035	-0.005
	(0.036)	(0.033)	(0.032)	(0.035)	(0.036)	(0.031)	(0.019)
Freight Costs	-0.797***	-0.798***	-0.814***	-0.826***	-0.808***	-0.808***	-0.805***
	(0.065)	(0.065)	(0.067)	(0.068)	(0.067)	(0.067)	(0.068)
Tariffs	-0.093***	-0.091***	-0.085***	-0.092***	-0.099***	-0.101***	-0.097***
	(0.022)	(0.022)	(0.021)	(0.021)	(0.019)	(0.019)	(0.019)
Log(R&D/Sales)	0.023***	0.023***	0.023***	0.024***	0.023***	0.023***	0.023***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Log(Capital/Labor)	0.020***	0.020***	0.018***	0.019***	0.019***	0.021***	0.019***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Log(Skilled/Unskilled)	0.003	0.003	0.004	0.002	0.003	0.004	0.003
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Productivity Dispersion	-0.005	-0.005	-0.004	-0.005	-0.004	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Elasticity of Demand	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Catholics	0.042	0.033	0.048	0.045	0.050	0.074*	0.066*
	(0.038)	(0.038)	(0.035)	(0.037)	(0.037)	(0.040)	(0.036)
Protestants	0.044	0.040	0.087**	0.075	0.088*	0.146**	0.177*
	(0.054)	(0.051)	(0.042)	(0.052)	(0.052)	(0.069)	(0.060)
English		-0.042*	-0.034	-0.039	-0.033	-0.018	-0.026
		(0.022)	(0.023)	(0.025)	(0.024)	(0.025)	(0.023)
Log(GDP)			0.020**	0.020**	0.021**	0.026***	0.019**
			(0.008)	(0.009)	(0.009)	(0.010)	(0.009)
Trust				0.000	-0.000	-0.000	0.000
				(0.000)	(0.000)	(0.000)	(0.000)
Government Stability					0.022*	0.027**	0.022**
					(0.012)	(0.012)	(0.011)
Observations	251,505	251,505	250,385	239,845	236,552	236,552	231,988
R^2	0.090	0.092	0.100	0.099	0.103	0.106	0.099

Note: The table reports estimates of OLS regressions in columns (1) - (5) and of an IV regression in columns (6) and (7). The F-statistic of the latter is 135.66. Robust standard errors are clustered at the country level and presented in brackets. ***, **, * denote 1, 5, 10 % significance.

classification available in the public version of the U.S. Census is coarser than industry classification in the database of the U.S. Bureau of Customs and Border Protection. When we control for the country and year fixed effects, we continue to find a strong negative association between cultural distance and intra-firm import share.[22] The magnitude of the estimate is somewhat smaller but this reduction in magnitude may simply reflect a decrease in the signal-to-noise ratio in a regression with many fixed effects (see Griliches and Hausman 1986). The coefficient on $Culturaldistance^{(2)}$ remains negative but loses its significance. The lack of significance is not surprising given that this measure assigns the U.S. individualism score to all respondents of the U.S. Census and, thus, takes out some of the variation on the industry level.

[22] Note that the variable geographical distance, which does not vary across industries is absorbed into country fixed effects.

Table 3: *Determinants of U.S. Intra-firm Import Shares.*

	Dependent variable: $IFIS$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Culturaldistance^{(1)}$	-0.484***			-0.213**		
	(0.028)			(0.106)		
$Culturaldistance^{(2)}$		-0.413***			-0.070	
		(0.024)			(0.236)	
$Culturaldistance^{(3)}$			-0.476***			-0.221**
			(0.028)			(0.101)
Log(geodist)	-0.071***	-0.081***	-0.082***			
	(0.010)	(0.010)	(0.010)			
Freight Costs	-0.472	-0.502	-0.500	-0.499	-0.505	-0.505
	(0.430)	(0.429)	(0.418)	(0.420)	(0.420)	(0.420)
Tariffs	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(R&D/Sales)	0.039***	0.039***	0.039***	0.040***	0.040***	0.040***
	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)	(0.013)
Log(Capital/Labor)	0.034***	0.034***	0.034***	0.027**	0.027**	0.027**
	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)
Log(Skilled/Unskilled)	-0.009	-0.003	-0.003	0.006	0.007	0.007
	(0.037)	(0.037)	(0.037)	(0.038)	(0.038)	(0.038)
Productivity Dispersion	-0.002	-0.003	-0.003	-0.006	-0.005	-0.005
	(0.036)	(0.035)	(0.035)	(0.037)	(0.037)	(0.037)
Elasticity of Demand	-0.003**	-0.003**	-0.003**	-0.003**	-0.004**	-0.004**
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Observations	37,173	37,173	37,173	37,173	37,173	37,173
Fixed Effects	None	None	None	Ctr/Year	Ctr/Year	Ctr/Year
R^2	0.147	0.142	0.139	0.268	0.269	0.269

Note: The table reports estimates of OLS regressions. Robust standard errors are clustered at the country level and presented in brackets. ***, **, * denote 1, 5, 10 % significance.

In the last robustness check, we repeat our exercise using a slightly modified measure of cultural distance. More specifically, we expand our definition of cultural distance to include the other three Hofstede's cultural dimensions: power distance, masculinity, and uncertainty avoidance. Power distance measures the extent to which the less powerful members of organizations and institutions (in society and the family) accept and expect that power is distributed unequally. Masculinity refers to the dominance of men over women and to the dominance of "male" values such as assertiveness and competitiveness versus norms of caring and modesty. Uncertainty aversion measures a society's tolerance for uncertainty and the extent to which members of society feel either uncomfortable or comfortable in situations that are novel, unknown, surprising, different from usual. Uncertainty avoiding cultures try to minimize the possibility of such situations by strict laws and rules, safety and security measures. They are less tolerant and reject forms of diversity within society. The cultural distance measures we use are the sum of the absolute differences of the four different indicators in the country of origin of the imports and the constructed index in the U.S. sector based on ethnic shared derived from the census. We rerun our original regressions using these measures and report the associated coefficients in Tables 4, 5, and 6 in Appendix B.

As before, the negative effect of cultural distance on the intra-firm import share is significant and robust to various specifications. Yet, the magnitude of the effect is generally slightly lower than in the original regressions using only the individualism-collectivism dimension. This confirms our original conjecture that the individualism-collectivism dimension is the main cultural distance variable across countries.

5 Conclusion

We presented an incomplete contract model of global sourcing with culturally dissimilar countries. In this model, headquarter managers decide whether to source intermediate inputs from independent suppliers or integrate the latter into firm boundaries against the backdrop of private costs associated with cross-cultural collaboration. The key prediction of our model is that greater cultural distance will reduce the headquarters' incentive to source inputs from an integrated supplier. Using an extensive dataset on U.S. firms' related-party imports and the well-known cultural dimensions by Hofstede, we find a strong empirical support for our key prediction, controlling for a great range of additional variables and accounting for the issue of endogeneity. Although we cannot rule out that cultural motives for the international make-or-buy decision may also work via other channels than the ones suggested in our model, our empirical results show that cultural motives can shed new light on patterns of international trade and organization of production.

Our theoretical framework leaves open several questions for future research. First, cultural dimensions in the current version of model affect solely managerial job satisfaction. While we believe that our results will continue to hold if we allow for workers' job satisfaction, a study of organizational structure and international team-work in a multi-cultural environment might be an appealing research agenda in itself. Second, we abstracted from the canonical property rights approach by Grossman and Hart (1986) and Hart and Moore (1900). Our empirical work, however, suggests that both theories may simultaneously explain the international make-or-buy decision. An investigation of the interaction between these two alternative explanations of a multinational firm's boundaries in a unified theoretical framework may constitute an interesting research agenda.

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Appendix

A Theoretical Appendix

A.1 Proof of Lemma 2

A simple differentiation of Ω^ℓ with respect to Θ yields after simplification

$$\frac{\partial \Omega^\ell}{\partial \Theta} = \frac{(\Theta(1+c^\ell)+2c^\ell)(1+c^\ell)\Theta}{(\Theta(1+c^\ell)+c^\ell)^2} - \frac{s((\Theta)^2+3\Theta+4-2s)\Theta}{(\Theta+1)^3}. \tag{25}$$

Notice that

$$\frac{\partial^2 \Omega^\ell}{\partial \Theta \partial c^\ell} = -\frac{2c^\ell}{(\Theta(1+c^\ell)+c^\ell)^3} < 0.$$

That is, if $\frac{\partial \Omega^\ell}{\partial \Theta} > 0$ holds for the highest possible c^ℓ (i.e. $c^\ell = 1$), it holds a fortiori for all $c^\ell < 1$. Utilizing $c^\ell = 1$ in (25), we have $\frac{\partial \Omega^\ell}{\partial \Theta} > 0$ if and only if

$$LHS = \frac{2(2\Theta+2)}{(2\Theta+1)^2} > \frac{s(\Theta^2+3\Theta+4-2s)}{(\Theta+1)^3} = RHS. \tag{26}$$

The right-hand side (RHS) of this inequality is strictly increasing in s, as can be seen from

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

That is, if inequality (26) holds for $s = 1$, it holds a fortiori for all $s < 1$. Substituting $s = 1$ in the right-hand side of inequality (26), we obtain

$$LHS = \frac{2(2\Theta+2)}{(2\Theta+1)^2} > \frac{\Theta^2+3\Theta+2}{(\Theta+1)^3} = RHS|_{s=1}.$$

Rearranging this inequality, immediately yields

$$LHS - RHS|_{s=1} = \frac{3\Theta^2+5\Theta+2}{(2\Theta+1)^2(\Theta+1)^3} > 0. \qquad \square$$

A.2 Proof of Proposition 2

Notice from (22) that B^ℓ enters Ω^ℓ with the same sign as Θ. Hence, the fact that $\partial\Omega^\ell/\partial\Theta > 0$ (cf. Lemma 2) immediately implies $\partial\Omega^\ell/\partial B^\ell > 0$. Since B^ℓ is decreasing in τ^ℓ (cf. (12)), τ^ℓ has a negative impact on Ω^ℓ.

B Figures and Tables

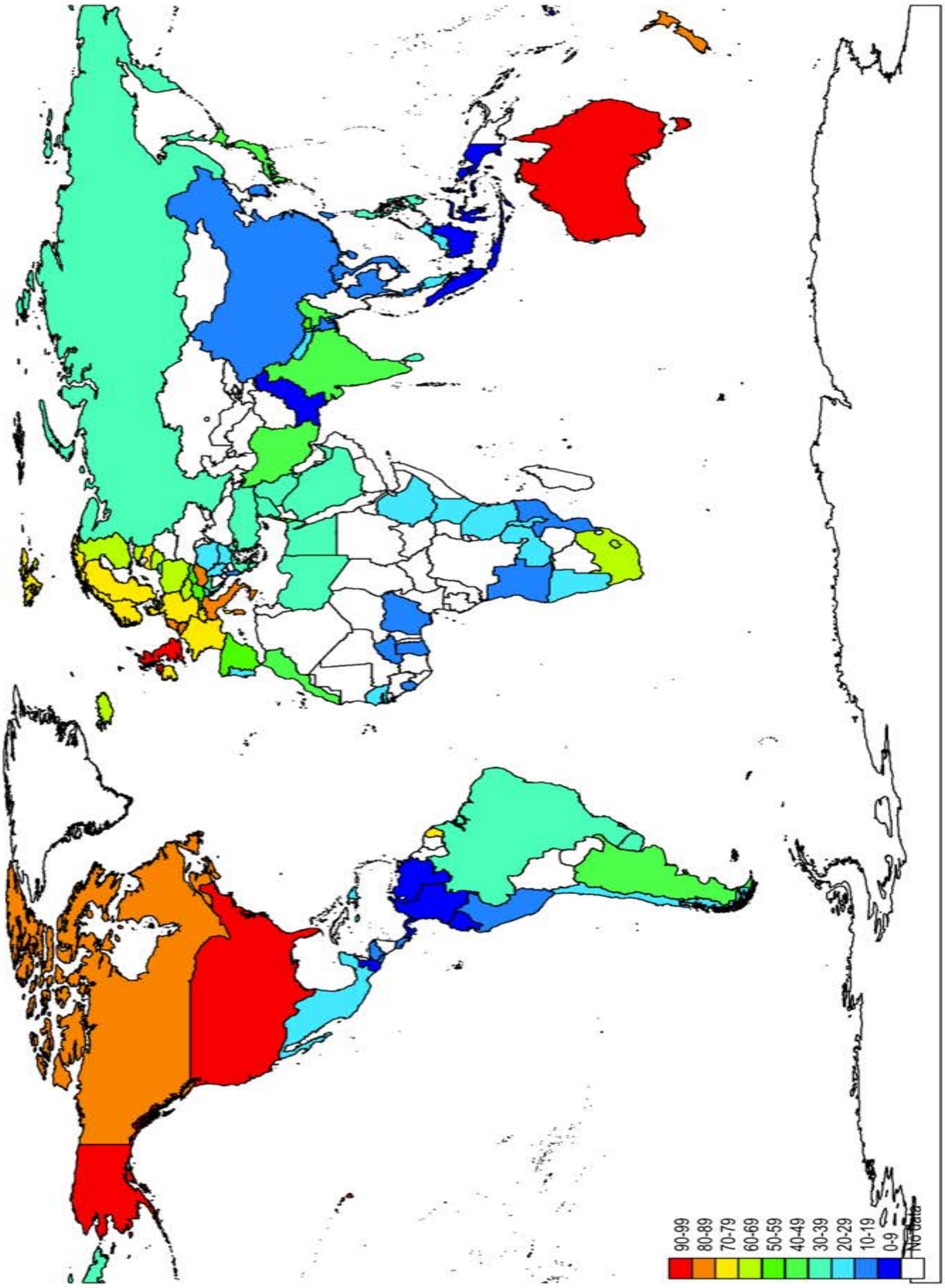

Figure 2: *Individualism Scores.*

Table 4: *Determinants of U.S. Intra-firm Import Shares.*

	Dependent variable: $IFIS$			
	(1)	(2)	(3)	(4)
Cutural distance	-0.106***	-0.105***	-0.105***	
	(0.023)	(0.023)	(0.023)	
Log(geodist)	-0.060*	-0.059*	-0.059*	-0.057*
	(0.032)	(0.032)	(0.032)	(0.028)
Freight Costs	-1.068***	-0.795***	-0.809***	-0.807***
	(0.074)	(0.063)	(0.064)	(0.064)
Tariffs	-0.192***	-0.119***	-0.102***	-0.109***
	(0.027)	(0.022)	(0.021)	(0.021)
Log(R&D/Sales)		0.023***	0.023***	0.024***
		(0.002)	(0.002)	(0.002)
Log(Capital/Labor)		0.020***	0.021***	0.022***
		(0.004)	(0.004)	(0.004)
Log(Skilled/Unskilled)		0.001	0.003	0.004
		(0.006)	(0.006)	(0.006)
Productivity Dispersion			-0.005*	-0.004
			(0.003)	(0.003)
Elasticity of Demand			-0.001***	-0.001***
			(0.000)	(0.000)
Observations	255,565	255,565	255,565	255,565
R^2	0.054	0.066	0.067	0.047

Note: The table reports estimates of OLS regressions. Robust standard errors are clustered at the country level and presented in brackets. ***, **, * denote 1, 5, 10 % significance.

Table 5: *Determinants of U.S. Intra-firm Import Shares.*

	Dependent variable: $IFIS$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cutural distance	-0.080***	-0.109***	-0.074**	-0.076**	-0.061**	-0.080	-0.126*
	(0.020)	(0.025)	(0.029)	(0.031)	(0.032)	(0.072)	(0.065)
Log(geodist)	-0.020	-0.019	-0.027	-0.027	-0.035	-0.036	-0.005
	(0.033)	(0.032)	(0.029)	(0.032)	(0.032)	(0.033)	(0.021)
Freight Costs	-0.801***	-0.805***	-0.821***	-0.833***	-0.812***	-0.813***	-0.808***
	(0.064)	(0.064)	(0.066)	(0.067)	(0.066)	(0.066)	(0.068)
Tariffs	-0.100***	-0.098***	-0.089***	-0.097***	-0.103***	-0.102***	-0.099***
	(0.022)	(0.022)	(0.021)	(0.021)	(0.019)	(0.019)	(0.019)
Log(R&D/Sales)	0.023***	0.023***	0.023***	0.024***	0.023***	0.023***	0.023***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Log(Capital/Labor)	0.021***	0.021***	0.019***	0.020***	0.020***	0.021***	0.019***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Log(Skilled/Unskilled)	0.003	0.004	0.004	0.003	0.004	0.004	0.003
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Productivity Dispersion	-0.005*	-0.005*	-0.005	-0.005	-0.004	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Elasticity of Demand	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Catholics	0.071*	0.057	0.071**	0.071**	0.077**	0.070	0.060
	(0.037)	(0.038)	(0.035)	(0.034)	(0.035)	(0.044)	(0.041)
Protestants	0.128***	0.110**	0.160***	0.146***	0.155***	0.140*	0.107
	(0.047)	(0.047)	(0.037)	(0.051)	(0.053)	(0.078)	(0.072)
English		-0.061**	-0.043	-0.047	-0.035	-0.045	-0.067
		(0.028)	(0.027)	(0.031)	(0.029)	(0.044)	(0.043)
Log(GDP)			0.025***	0.025***	0.026***	0.025**	0.016
			(0.009)	(0.010)	(0.010)	(0.011)	(0.010)
Trust				0.000	-0.000	-0.000	0.000
				(0.000)	(0.000)	(0.000)	(0.000)
Government Stability					0.027* *	0.025*	0.019
					(0.012)	(0.014)	(0.015)
Observations	251,505	251,505	250,385	239,845	236,552	236,552	231,988
R^2	0.073	0.077	0.089	0.088	0.093	0.092	0.087

Note: The table reports estimates of OLS regressions in columns (1) - (6) and of an IV regression in column (7). The F-statistic of the latter is 135.66. Robust standard errors are clustered at the country level and presented in brackets. ***, **, * denote 1, 5, 10 % significance.

Table 6: *Determinants of U.S. Intra-firm Import Shares.*

	Dependent variable: $IFIS$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Culturaldistance^{(1)}$	-0.180***			-0.108*		
	(0.018)			(0.063)		
$Culturaldistance^{(2)}$		-0.193***			0.222	
		(0.016)			(0.148)	
$Culturaldistance^{(3)}$			-0.172***			-0.171**
			(0.018)			(0.073)
Log(geodist)	-0.067***	-0.069***	-0.069***			
	(0.010)	(0.010)	(0.010)			
Freight Costs	-0.402	-0.417	-0.414	-4.445	-4.445	-4.445
	(0.439)	(0.441)	(0.439)	(0.415)	(0.418)	(0.417)
Tariffs	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(R&D/Sales)	0.040***	0.039***	0.039***	0.042***	0.042***	0.042***
	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)
Log(Capital/Labor)	0.037***	0.037***	0.037***	0.028**	0.029**	0.029**
	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)
Log(Skilled/Unskilled)	-0.013	-0.010	-0.010	0.008	0.008	0.008
	(0.037)	(0.037)	(0.037)	(0.038)	(0.038)	(0.038)
Productivity Dispersion	0.010	0.009	0.009	0.005	0.006	0.006
	(0.036)	(0.036)	(0.036)	(0.037)	(0.037)	(0.037)
Elasticity of Demand	-0.003**	-0.003**	-0.003**	-0.004**	-0.004**	-0.004**
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Observations	33,825	33,825	33,825	33,825	33,825	33,825
Fixed Effects	None	None	None	Ctr/Year	Ctr/Year	Ctr/Year
R^2	0.107	0.095	0.091	0.286	0.286	0.286

Note: The table reports estimates of OLS regressions. Robust standard errors are clustered at the country level and presented in brackets. ***, **, * denote 1, 5, 10 % significance.