The Future of Economic Geopolitics:

Network Effects in Intercultural Trade

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Abstract

Using a regression discontinuity design on a gravity model of trade among 36 Middle Eastern and East Asian countries between 1980 and 2014, this study demonstrates network effects in trade. A small improvement in trade between subsets of two cultural blocs diminishes the effect of cultural similarity on trade between all members of the two cultural blocs. The result holds regardless of whether cultural similarity was originally a boon or drag on trade. Furthermore, international businesses adjust to new intercultural acumen very rapidly. The effect demonstrated herein points toward an answer to economic dilemmas posed by Huntington's "clash of civilizations."

Keywords: International trade, interregional trade, culture, gravity model, globalization, geopolitics, regression discontinuity design

JEL Classification: F1, F5, B27

Section I: Introduction

International trade is an important part of international economic development. It permits individuals in countries with more trade the ability the choose from a greater variety of goods and allows firms to sell their goods to a larger market at potentially higher prices, sustaining business when domestic demand cannot. These firms become more productive through broader business contact (Atkin, Khandelwal, and Osman, 2017). Furthermore, trade leads to competition, as the most productive firms compete internationally, absorbing customers and resources from the least productive firms (Melitz, 2003). This tendency does not only improve productivity. It also weakens monopolists' power to set high prices on goods like cereals or telecommunications, and monopsonists' power to force down wages as foreign firms set up operations locally—both developments that especially help the poor in developing countries (Goldberg, 2018).

Many question the benefits of globalized trade, asserting that it merely benefits Western elites rather than the developing world. If trade is nearly as prosperity-inducing as the conventional wisdom indicates, however, then it is Western policymakers and businesses that should be concerned. Even though the combined GDP of Western countries in 2014 was over $40 trillion (World Bank, 2018), larger than the combined GDPs of all other countries by about $3 billion, trade among Western countries clocked in at only $5.6 trillion, well below the $6.1 trillion traded among non-Western countries (Barbieri and Keshk, 2016). Currently, many countries look to the robust, advanced economies of the West for business opportunities, yielding an additional $6.5 trillion (Barbieri and Keshk, 2016). By 2050, however, analysts at PwC (2017) project that the economies of non-Western countries like China, India, Indonesia, Brazil, Russia, Mexico, Turkey, Nigeria, and the Philippines will easily dwarf Western economies, possibly sidelining

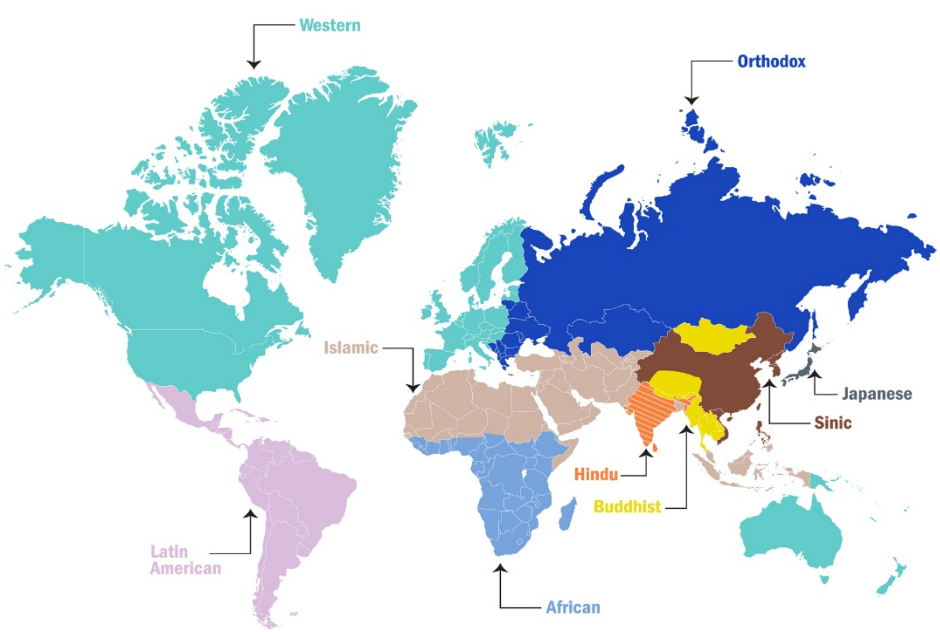
Western businesses and economies, languishing near their present levels of activity. Meanwhile, the growth in international trade in the late 20th century was already shown to come mostly within cultural regions. Although interregional trade grew and deepened over that timeframe, it was outpaced by trade within regions such as East Asia or Latin America (Kim and Shin, 2002).

This trend does not only threaten to leave Western economies behind. There is also a concern—particularly in light of China's recent trend of exporting its police-state technology (Benaim and Gilman, 2018; Doffman, 2018) and supporting friendly dictators and corrupt regimes (Abi-Habib, 2018)—that not all trade relationships' growth is value-neutral.

While this perspective on globalization may be somewhat new to economics, it has deep roots in other disciplines. In the wake of the Cold War, in contrast to some political scientists' presumption that globalization would make the world freer, closer, richer, and more stable (Fukuyama, 1992), Samuel Huntington famously predicted instead that the world would return to older divisions based on broadly-shared cultural customs and histories, a theory now dubbed the "clash of civilizations" (Huntington, 1996; see Figure 1).

Most popular analyses of this theory focus on the security implications of such a conflict, but it also has a profound connection to international economics. Will the clash expand economic opportunities among "in-group" members at the expense of "foreigners?" What will be the nature of trade networks formed in the wake of this clash? If culture interacts with the economic order to become a key geopolitical obstacle, as the data seems to indicate, will there be cultural conduits in international economics akin to the geographic chokepoints, such as the Strait of Malacca or Suez Canal, so heavily emphasized in past geostrategies (Mahan, 1890)? What are the implications of these changes on human development and the international liberal order?

Figure 1: Huntington's Clash of Civilizations



Effective economic policy to navigate this geopolitical landscape is far from clear. China's Belt and Road Initiative has spurred equal parts apprehension and buzz, as the prospect of Chinese economic influence in Eurasia frightens Western policymakers as much as the prospect of externally-funded infrastructure excites Western businesses. Despite apprehension over China economic geostrategy in Eurasia, the European Union (EU) has stalled for decades on any sort of comprehensive trade agreement with the Gulf Cooperation Council (GCC), seeing it as economically unimportant (Hashmi, Al-Eatani, and Shaikh, 2014). Nevertheless, the EU billed its expansion to the east 20 years ago as a similar sort of geostrategy, intended to integrate central and eastern Europe into regional value chains, spark economic development, and tie the continent together. However, it is unclear that their efforts had any effect (Kaplan, Kohl, and Martinez-Zarzoso, 2018). Meanwhile, improvements in infrastructure and telecommunications over the last four decades have drastically diminished physical barriers to trade, making trade an ever-more important part of international businesses (Bernhofen, El-Sahli, and Kneller, 2016; Fink, Mattoo, and Neagu 2005; Bougheas, Demetriades, and Morgenroth, 1999).

In sum, even as the key aspects of the international economic order are clearly shifting away from openness and simple economic concepts toward geopolitics, the connections between regional, cultural, and economic interests are as murky as they are consequential for human development.

None of this is to say that policymakers should undermine non-Western economies and trade. On the contrary, the rise of these economies offers new opportunities for all businesses and consumers with the ability to trade with them. Instead, policymakers will want to mitigate the growing obstacles to trade represented by cultural barriers. If returns to small improvements in intercultural trade are non-linear, there may be an opportunity to open trade conduits between cultural blocs similar to geostrategic chokepoints of the past.

Policymakers need quantitative rigor to form well-considered strategies for the new economic landscape. If the role of cultural barriers in shaping trade patterns will resemble the role of geographic barriers, the best model of international trade will account for both forms of barrier. The gravity model, as the most successful and versatile model in international economics, fits this role well. It was first developed to model the economic reality that, despite trade theorists' conventional wisdom that factor and technological diversity primarily drive trade, market size and physical distance, with great consistency, are the best empirical predictors of trade patterns. Now often used to model cultural impacts, the gravity model can once again provide much-needed clarity on international economic realities.

In this study, I combine the gravity model of trade with a regression discontinuity design employing data from the Middle East and East Asia during the modern era to ascertain the existence of network effects in intercultural trade. The findings suggest tentative but unmistakable support for this hypothesis that cultural networks affect international trade. The paper will continue as follows: Section II will review the literature on the gravity theory's origin and robustness, its extensions to topics of geopolitical interest, and indications that there may be network effects in intercultural trade. Section III will outline the theoretical framework. Section IV will describe the collection and cleaning of data as well as the methodologies using that data. Section V will contain the results and discuss their interpretations. Section VI will conclude and describe implications.

Section II: Literature Review

The Gravity Model

The gravity equation itself is actually quite old: it was invented by Sir Isaac Newton to describe the force attracting all mass together. In the 1940s, John Q. Stewart, a social physicist at Princeton University fond of drawing parallels between physical and social concepts, began describing a "demographic gravity" model, in which individuals operate like molecules, with relative importance, distance from each other, and a "demographic energy" between them (Bergstrand and Egger, 2011). He indicated that, like in Newton's gravity equation, demographic energy should be directly proportional to each individual units' mass, but inversely proportional to the distance between them. Economists picked up the idea and began thinking about its applications.

Savage and Deutsch (1960) devised an econometrically sound method for investigating oddities in international trading patterns. They showed that, with the simple use of a matrix of export relationships between sets of countries, a null model of trade could be predicted from each country's prominence in the global economic system, i.e. from its size. This model was the first not to explain changes in trade patterns, but to attempt to point out reasons for patterns as they are. The authors were among the first to question what seemed to be an odd trend of clusters of trade relationships in the Organization for Economic Cooperation and Development (OECD), where comparative advantage did not seem the primary motivator. Tinbergen (1962) published a book soon after, suggesting that the international economic order revolved not just around large countries but around neighbors and proximate countries. Toward the end of the decade, Armington (1969) discovered that, despite the predictions of the most rigorously proven theories of trade, countries exhibited a persistent "home bias" in their consumption of goods on the international market.

Over the next few decades, a consensus developed that the "social physics" of gravity applied remarkably well to the patterns of international trade: relationships clustered around nearby countries but skewed toward those countries that produced more per capita. The linear regression derived from the gravity equation's multiplicative form related the logarithm of trade volume between two countries to the logarithm of each country's real GDP per capita and to the distance between them. Economists found it to regularly correlate heavily with observed trading patterns, and thus began regularly using it to test theories. In one example, a modified gravity equation was used on the American paper and paperboard industry to ascertain the strength of the theory of intervening opportunities (which states that it is not size of and distance between termini, but the availability of opportunities along the way, that determines the path of an economic pattern).

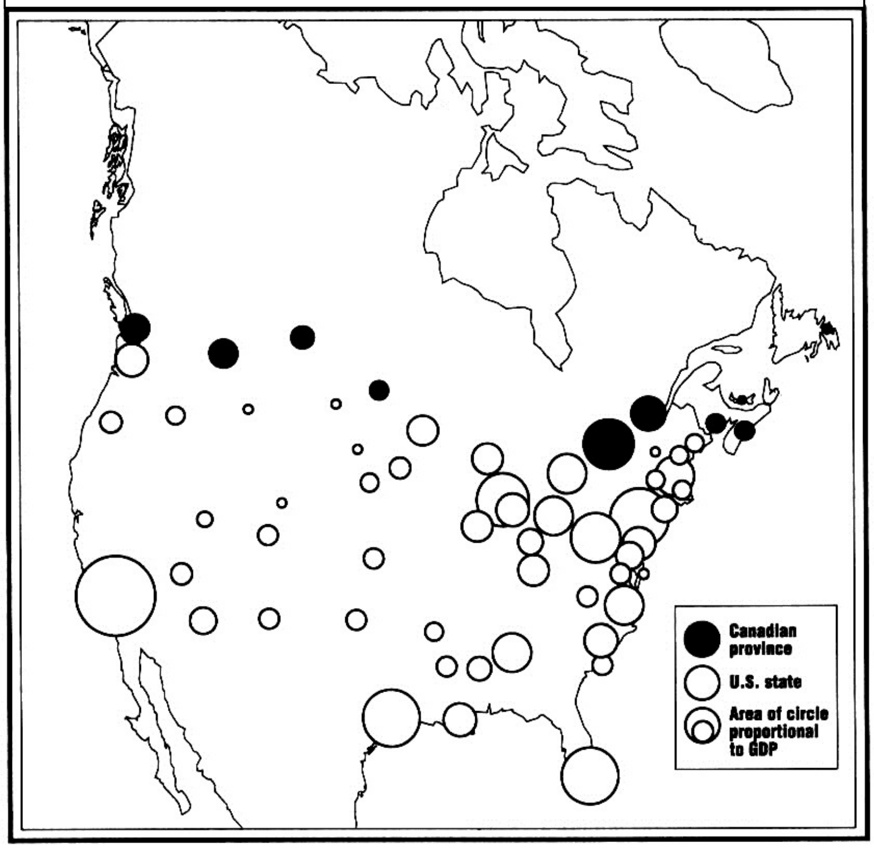
Gravity explained 43% of the paper industry's trade, while intervening opportunities explained only 3% (Dison and Hale, 1977).

Nevertheless, mainstream trade theorists had trouble taking seriously the gravity theory's explanation of trade in terms of the distance between and sizes of economies. It was statistically accurate, but there was no economic theory guiding its interpretation, and there could certainly be no causal links determined using it. In 1979, Anderson derived a theoretically-grounded gravity model from the GDP-based international expenditure equation, assuming identical homothetic preferences across countries for multiple commodities flowing in all directions and constant elasticity of substitution (CES) indifference curves. However, gravity's "use [was] at the widest limited to countries where the structure of traded-goods preference [was] very similar and, subsidiarily, where trade tax structures and transport cost structures [were] similar (Anderson, 1979)."

With some more theoretical rigor, gravity models began entering the mainstream. Daniel Trefler (1995) custom-tweaked the Heckscher-Ohlin-Vanek model to address its age-old inability to accurately predict trade based on factor abundance. His paper demonstrated that none of these amendments fixed the "case of the missing trade" except for allowing variation by productive technology in wages across countries and, crucially, including "home bias," as first suggested by Armington (1969) and increasingly confirmed by the gravity equation. In 1995, McCallum's "border puzzle" shocked the trade world. The case study of Canada and the US demonstrated, using the gravity theory, that without the Canada-US border—a rather porous border between rather similar countries—blocking trade between provinces and states, Canadian interprovincial trade's current 20-fold edge on trade with the US would evaporate entirely

(McCallum, 1995). Included in the paper was a rather striking visual representation of the logic of the gravity equation (Figure 2).

Figure 2: Economic map of North America



The immediate shock of that result forced the economics community to wrestle with the remaining problems of the gravity equation: the model was far better at producing valid predictions than the best trade theories, and it easily produced food for thought for economists and policymakers alike (who in the 1990s were very interested in the economic impact of softening borders and were thus shocked at the impact of such an innocuous one as the US-Canada border); nevertheless, gravity's results were untrustworthy on account of its "dubious theoretical heritage" and weak assumptions undergirding its mathematical validity (Deardorff, 1984).

In 2004, Anderson and van Wincoop solved the by-then-notorious McCallum border puzzle, deriving the gravity equation from a general equilibrium in which all trade relationships and price levels must be collected to determine each country's "multilateral resistance" to imports and exports. They determined that the 20-fold shift in Canada's trade could not be definitively attributed to the US without a border, because that would reconfigure the entire world trading system, leading to trade deflection and price changes around the world (Anderson and van Wincoop, 2004). This formulation, where at the very least importer and exporter fixed effects are a necessity for unbiased estimation of trade patterns using gravity, has become a gold standard in the now rather theoretically rigorous subfield of trade theory devoted to variations of the gravity equation.

The gravity theory has assembled a long-resume of accomplishments. Among them, one study showed a 50% cut in the markup of goods at a receiving port (which includes insurance, transport costs, and tariffs) compared to the departure port, in OECD countries between 1958 and 1988, led to an 8% increase in world trade (Baier and Bergstrand, 2001). Another study showed that decreasing infrastructure quality to the median from 75th percentile levels increases trade costs by 12% (Limão and Venables, 2001). A third demonstrated that political détente significantly improves trade (van Bergijk and Oldersma, 1989), and a fourth found that a one day increase in a good's ocean travel time decreases the chances of that good's purchase abroad by 1% (Hummels, 2001).

It is now well-known that there are numerous varieties of trade costs that are representable as distance in gravity equations, including the natural ones imposed by the cost and time of international shipping, artificial ones involving tariffs and non-tariff barriers, and more slippery but perhaps interesting concepts of information and trust barriers.

Extensions of the Gravity Model

Researchers have extended the gravity model to numerous demographic and international relations concepts that often relate to or proxy for the informational and insurance costs less readily measured than simple geographic distance or tariff levels. One of the first to study such concepts was Melitz, whose 2002 study utilizing gravity as a template indicated the importance of common language, translation, and even simple literacy to trade volumes (Melitz, 2002). Melitz and Toubal (2014) later expanded this template to show that common official language, common spoken language, common native language, and even linguistic similarity of linguistically distinct people's positively affect trade by facilitating communication and trust. Meanwhile, Casella and Rauch (2002) derived a theory, based on the historical and modern experience of many diasporas ranging from overseas Chinese in modern Southeast Asia to medieval Jews and Armenians, whereby a minority with access to "complete information" on foreign markets and instinctive trust due to ethnic ties can improve international trade ties both for themselves and for the system as a whole. The findings indicate that information on culture is an important determinant of international trade.

An empirical study of trade between Niger and Nigeria—which share the Hausa ethnic group on either side of an arbitrary border drawn by the British and French—represents a natural quasi-experiment where researchers could observe the impact of the border on millet and cowpea prices in the presence of ethnic similarity and difference. The researchers found an unequivocal link between ethnic and price difference and speculate in their case that the reason may relate to trust and customs, since many traders in the region rely on short-term informal loans where the implied interest rate and maturation period differs from one ethnic group to the next (Aker, Klein, O'Connell, and Yang, 2014).

In a groundbreaking 2007 study, "Is God good for trade?", Helble found, even after controlling for political regime types and conflicts, that religious similarity—in most cases—promotes trade. The author utilized a gravity model and innovative measurements of religious similarity between countries—as well as measures of interfaith contact—to highlight the trade-friendly attitude of Christianity, Islam, and, especially, Judaism. This pattern held even while interfaith trade suffered between the former two and Hinduism (Helble, 2007). Another groundbreaking study on the far-reaching consequences of cultural systems found that protection for external and non-concentrated investments varies systematically across legal systems' cultural basis via Roman civil law (through France), Islamic law, or English, German, or Scandinavian common laws. These protections have significant effects for international trade, even where a country's legal system is exogenously determined due to the vicissitudes of imperial history (Porta, Lopez-de-Silanes, and Shleifer, 2008).

Dunlevy and Hutchinson (2001), meanwhile, described three mechanisms by which immigration promotes trade (in the history of the United States, at least): immigrants have new preferences, necessitating new trade flows and offering new business opportunities for those providing them; immigrants know about foreign markets and cultures, and often bring in new expertise; finally, immigrants tend to possess transnational networks. All three mechanisms, and indeed most mechanisms by which language, ethnicity, or religion affect trade, can be described as derivations of the informal information and insurance costs cultural barriers impose on international trade.

Since then, most gravity studies address multiple dimensions of "proximity," such as political, ethnic, religious, linguistic, or historical similarity, including at least one measure for each category. Zhou (2010) sought to clarify the rate of change of trade and determinants of trade patterns since the Cold War's end; it is a good example of modern gravity specifications that include a bevy of additional variables. These include membership in inter-governmental organizations like the International Monetary Fund; former colonial ties, such as that between two countries formerly colonized by France or between France and a former colony; and many others (Zhou, 2010). One especially innovative study by Gokmen (2017) included these demographic variables as controls as it confirmed the existence of a "clash of civilizations" in trade via a regression discontinuity design (RDD) across the end of the Cold War. It confirmed the waxing significance of cultural difference as a barrier to trade, especially among former strategic allies no longer bound by Cold War geopolitics.

As far as the effect of politics and policy on trade is concerned, Rose (2007) sought to test whether the foreign service, which, in most countries, sees trade promotion and facilitation as a core objective, is actually effective in that task. He found a positive but non-linear, diminishing impact of embassies and consulates on trade, with the impact of an additional foreign mission in a foreign country increasing bilateral trade by an average of 6%. In contrast, Acemoglu and Yared (2010) indicated that as multipolar political competition has increased in the Cold War's immediate aftermath, trade volumes diminished not only due to a country's own militarization, but even simply due to neighbors' militarization. These countervailing forces demonstrated the importance of stability, diplomacy, and political ties to international trade.

Network Effects

At the same time that economists have increasingly understood how cultural barriers—or perhaps more properly, the lack of cultural proximity—impose costs on trade, the relative significance to international business of these implicit information and insurance costs has increased. The advent of containerization significantly reduced transportation costs by integrating land and sea transport systems, speeding transfer of cargo by up to 40-fold, and decreasing damage and theft of goods in comparison to the previous break-bulk method of shipping (Bernhofen, El-Sahli, and Kneller, 2016). Since infrastructure plays a crucial role in bilateral trade via transportation costs (Bougheas, Demetriades, and Morgenroth, 1999), increasing development of global infrastructure, well-represented by, though not limited to, China's Belt and Road Initiative, has increased trade and diminished the marginal impact of new infrastructure and distance on trade. At the same time, communication lines have been shown to significantly influence trade volumes (Fink, Mattoo, and Neagu, 2005), with increased and dispersed internet service linked to higher trade volumes (Freund and Weinhold, 2004).

In this Information Age, where overall trade volumes and basic market access are increasing, the ability to enter markets seems relatively less important than the ability to properly interpret information about foreign markets, parlay this information into smart supply chains and marketing campaigns, and develop a trustworthy foreign business reputation. Many factors would impact these capabilities, but the most geopolitically prominent among them should seem to be culture and related demographic variables.

The question remains, though, whether the insights into the demography of trade from the last 20 years point to meaningful policy strategies to improve global trade that do not rely on diminishing cultural distinctness. The key lies in how international businesses handle their lack of information about foreign business environments, how they obtain this information, and how they act once they have gathered it.

Section III: Theoretical Framework

This study builds on the gravity equation. The most basic formulation of the gravity model relates trade flows to the size of country pairs' economies and the distance between them as follows:

$$X_{ijt} = \frac{\alpha_0 Y_{it}^{\alpha_1} Y_{jt}^{\alpha_2}}{d_{ijt}^{\beta}}$$

where X_{ijt} is the current average value of exports in USD between countries i and j at time t, Y is current real GDP per capita, and d is any variable representing distance between countries. To estimate the equation, I take the natural logarithm to obtain:

$$\ln X_{ijt} = \alpha_0' + \alpha_1 \ln Y_{it} + \alpha_2 \ln Y_{jt} - \beta \ln d_{ijt} + \varepsilon_{ijt}$$

where α_1 and α_2 represent the trade elasticities of real GDP per capita for countries i and j, respectively, while β represents the elasticity of any distance variable. While the theory undergirding the gravity equation is flexible in permitting multiple distance variables, these variables must be readily interpretable and, ideally, should be continuous, logarithmic measures of distance or proximity in order to fit with the mathematical specification above. These needs must be weighed against a desire to let data speak rather than transforming it unnecessarily.

A theoretically rigorous gravity equation, however, must control for multilateral resistance. This has been shown numerous ways on multiple occasions since the original proof in Anderson and van Wincoop (2004) and is best summarized in Head and Mayer (2014), Section 2. This is most commonly done with one of many varieties of fixed-effects schemes; this paper is no exception and will outline the approach in the Methodology subsection.

It is well-known that companies, and especially large corporations, tend to seek out business opportunities outside their country, but must weigh the benefit of internationalizing—whether by trade or by investment abroad—against the costs and risks of international business. Standard trade costs are a relatively predictable matter, but implicit costs stemming from communication and trust issues (which create informal information and insurance costs) can pose a risk to international business that many firms may not be willing to undertake. Cultural barriers create significant information costs to international trade (Dunlevy and Hutchinson, 2001; Aker, Klein, O'Connell, and Yang, 2014), but once the metaphorical ice has been broken by business partners from two separate cultures, firms from countries in each cultural group become more confident operating in countries within the other cultural group. Barkema and Drogendijk's (2007) description of internationalization strategy attests to this theory on a more limited scale: Dutch companies profited from large-scale exploration of Central and Eastern European countries, quickly learning from mistakes to enable massive expansion of foreign market share and operations before cautious competitors can scale up their limited, risk-averse operations. However, only companies with prior international experience could manage this, and the more remote—measured holistically, not just geographically—a foreign market, the weaker this effect was. Thus, more culturally distinct markets encourage slow growth, but events that bring large knowledge transfers between international markets and facilitate knowledge transfer among internationally-operating firms can lower the risk of expansion enough that activity explodes. It is worth extending the idea beyond firm specific interactions to the aggregate behavior of firms engaging in international trade.

This study proposes that, while all trade costs are exogenous to individual firms, demographic trade costs are much more sensitive to the status of aggregate trade patterns than either government policies or natural trade costs. Specifically, there are significant third-country effects of intercultural trade for countries that share a culture. As a result, a substantial improvement in trade relations between a subset of countries in culture group A and countries in culture group B should lead to an improvement in overall trade relations between specific country pairs in culture groups A and B. If true, this would be a departure from the standard assumptions of gravity models that decisions on the size and destination of each consignment of goods are independent (Savage and Deutsch, 1960).

Section IV: Data and Methodology

This study uses a multidimensional gravity model, on account of its theoretical and empirical rigor, with a regression discontinuity design (RDD) to demonstrate cultural trade network effects in a limited case study of the bilateral trade flows within and between countries belonging to two cultural blocs. The model estimates trade relations between countries within and between the two regions across a key, singular, exogenous improvement in the recent trade relations of a relatively small subset of countries in one region with countries in the other. The RDD demonstrates that the effect of a limited change in intercultural economic relations reaches beyond the countries directly to trade within and between both cultural blocs; the method also forces the scope to exclude countries that are not in either region as the RDD can only effectively divide across the event for the cultural blocs involved in the discontinuity event. The observations represent panel data on country-pairs across time, with the "dyad-years" covering all unique permutations of two distinct countries for a pool of 37 countries over the 35 years from 1980 to 2014.

Data Collection

Following Huntington's (1996) approach of classifying countries into "civilization" categories, with amendments by the author, the study addresses trade within and between the "greater Middle East" and "greater East Asia." The "greater Middle East" consists of the Arab League, Turkey, Iran, Afghanistan, and Pakistan. These countries are commonly analyzed together by the CIA, State Department, and US military, as well as both Western and Middle Eastern news outlets. Countries Huntington categorizes into "Sinic," "Japanese," and "Buddhist" civilizations are agglomerated as "greater East Asia." This includes China, Mongolia, South Korea, Japan, Taiwan, Vietnam, Laos, Cambodia, Thailand, Myanmar, Bhutan, and Singapore. Palestine, Israel, Yemen, and North Korea were excluded due to the unique nature of their geopolitical history in this timespan relationships and/or the unavailability of reliable data. This yields a total of 36 countries.

These categorizations are not only based on the international relations literature surrounding the geopolitics of culture, but also represent economically and historically integrated areas. The "Middle East" considered in this paper has been linked by various empires and political movements, and many countries already collaborate economically and politically. The region's persistent underdevelopment and geopolitical importance makes a study of its trade relations particularly attractive. Furthermore, although East Asia has been economically important for the entire duration of the study's timeframe, and indeed has had strong ties to the Middle East throughout history via the Silk Road, the region's economic prominence has grown significantly since 1980. This allows new international economic connections to develop, permitting better insight into network effects in trade than would, say, a study involving the West, which for decades prior to this study's scope had strong economic ties with even an underdeveloped region like the Middle East.

Starting after the oil crises of the 1970s, the containerization revolution, the elimination of the Bretton Woods system, the end of the Cultural Revolution in China, and the unification of Vietnam, and including in its timeframe the acceleration of global economic liberalization, the late and post-Cold War, and the rise of the Information Age, the 1980-2014 timeframe fairly represents the modern era. At the same time, it does not represent an era of economic homogeneity. With 36 countries, 35 years, and excluding duplicate dyad-years (e.g. Singapore-Iran-1986 is redundant with Iran-Singapore-1986), I am left with a dataset of 22,050 observations.

My methodology derives from a straightforward extension of the gravity model that cautiously includes cutting-edge variables measuring physical, political, and cultural proximity, while avoiding diluting explanatory and interpretive power with either a "kitchen sink" approach or excessive deviation from the mathematical theory of the gravity model that has been proven by such researchers and Anderson and van Wincoop (2004). Therefore, the model limits the number of distance variables to the strict necessities. Where possible, it uses continuous variables of distance and proximity; where sensible, it uses logarithmic transformations.

Bilateral trade flows—a sum of the exports recorded by each country in a country pair to the other, smoothed across anomalous spikes and troughs—come from the Correlates of War Project's *International Trade v4.0* dataset, and are recorded in millions of current US dollars (Barbieri and Keshk, 2016). These are not transformed to constant USD because the gravity model relies upon assumptions that do not necessarily hold when values are inflation-adjusted. These bilateral trade flows are then transformed by a natural logarithm. This dependent variable is coded as ***lntrade.***

The variables critical to this study are the distance variables. For physical trade barriers, the model includes the logarithm of great circle distance, in kilometers, between two countries' average centers of population (coded as ***lnDistance)***, as well as a necessary binary indicator variable, ***border***, for border contiguity. These data come from the exhaustive dataset of dyadic gravity variables collected by Centre d'Études Prospectives et d'Informations Internationales (CEPII) (Head, 2014).

The demographic distance variables draw on best practices and data from multiple sources. The model includes Helble's (2007) measure of political regimes that combines a general recognition of the effect of democracy on trade with the separate but related effect of the difference regime types on trade. The variable is the logarithm of the product of each country's average *Freedom in the World* score, as constructed based on data from Freedom House (2019). The product ranges from one (both countries are highly democratic) to 49 (both countries are highly authoritarian), with products in the middle range representing either intensely different regime types or two regimes with equally mediocre political and civil rights. This score is transformed by the natural logarithm; it is more sensible to interpret the effect on trade of percentage changes in shared authoritarianism than of level changes of an artificial joint authoritarianism score. The variable is:

$$\boldsymbol{lnP_{ijt}} = \ln(F_{it}F_{jt})$$

Where F_{it} and F_{jt} are the average *Freedom in the World* scores in year t for countries i and j, respectively.

The measures of cultural distance and proximity used in this study include religion, a useful macroscopic indicator of cultural similarity; native language, a key granular measure of cultural distinctness; and spoken language, which falls between the two. The study omitted a direct measure of ethnicity because the data were unreliable and inconsistent across countries and the information is adequately included in the model by native language. It also omitted official language, since official languages are chosen for three reasons already accounted for by the model: it is commonly spoken in a country; it is a relic of imperial hegemony; English is a global lingua franca.

I borrow Helble's method for measuring religion, using the World Religion Project's *National Religion Project v1.1* dataset (Maoz and Henderson, 2013). For each country, I normalize the proportions of the religions in each country with a following greater than or equal to 3% of the population such that these proportions add to one; for each country pair, the normalized population proportions of each of these significant religious groups are multiplied (yielding the probability that two persons, one randomly selected from each country, will share that religion), and sum across all such products for a country-pair. This sum represents the probability that two persons, one randomly selected from each country, would share a religion (it would be zero if nobody shared the religion, and 1 if everyone did). The logarithm of this number enters the model as a continuous-variable measure of religious similarity, which should have a positive coefficient representing the percentage increase in bilateral trade correlated with a one-percentage-point increase in religious similarity. This measure of religious similarity is:

$$\boldsymbol{R_{ijt}} = \sum_{a=b=1}^{m} r_{ait} r_{bjt}$$

Where:

$i =$ country i in a country pair

$j =$ country j in a country pair

$m =$ the number of religions with a possibly significant presence in this study's scope

$a =$ a religion in country i

$b =$ a religion in country j

$i \neq j$

$r_{ait} =$ the normalized proportion of country i classified as religion a at time t

$R_{ijt} =$ the weighted religious similarity between countries i and j at time t

The final distance category—linguistic distance—consists of three proximity variables. I use Melitz and Toubal's (2014) measures of linguistic proximity, including two separate variables indicating the propensity of individuals in countries *i* and *j* to share a spoken or native language, respectively. Melitz and Toubal constructed these in nearly the same manner as described above for religion, with slight adjustments. They are coded as ***csl*** and ***cnl***, respectively.

Also included is Melitz and Toubal's rather more granular measure of the linguistic similarity of distinct languages. This linguistic proximity score is based on Levenshtein distance, which measures the number of subtractions, additions, or substitutions needed to turn one string into another. This score is calculated for words with identical meanings from a linguist-determined list of the 100-200 most important words in any given language and adjusted for noise from expected random similarities. The mathematical calculation for this measure is roughly:

$$DL_{ij} = \sum_{a=1}^{2}\sum_{b=1}^{2} dl_{ai,bj} l_{ai} l_{bj}$$

Where:

i = country i in a country pair

j = country j in a country pair

a = a native language in country i

b = a native language in country j

$i \neq j$

$dl_{ai,bj}$ = the reciprocal of an adjusted Levenshtein distance between languages a and b

l_{ai} = the normalized proportion of country i that natively speaks language a at time t

DL_{ij} = the weighted average native linguistic distance between countries i and j at time t

Toubal and Melitz transform the measure a few more times for a final measure of linguistic proximity, which I code as ***LingProx.*** Crucially, *LingProx* has a value of 0 when the top-two native language are comparable through *csl* and *cnl*, lending *LingProx* the interpretation of the effect on trade of native linguistic similarity less directly shared language. *LingProx, csl,* and *cnl* are all, unfortunately, time-invariant, but language, in any case, changes little over only 35 years. For a more complete discussion, please see Section 3 of Melitz and Toubal (2014).

Key control variables, also from Head's (2014) dataset via CEPII, are dyadic: common currency; common membership in some sort of economic union (this sample contains no examples of currency or customs unions, and only some regional trade agreements); common membership in the World Trade Organization or its predecessor, the General Agreement on

Tariffs and Trade; a common legal system origin, such as English common law or Islamic law; and a common colonial relationship (country *i* colonized or shared a colonizer with country *j* for some significant period).

More information detailing the collection, construction, merger, and cleaning of these data can be found in Appendix A.

Missing Data

As the Tables B1 and B2 in Appendix B clearly show, missing data was a significant, though by no means insurmountable, problem for this study. Seventy-six percent of observations were complete; the remaining 24% observations were missing a value for between one and four of the following variables: *lntrade, csl, cnl, LingProx.* Very rarely were more than two variables' values simultaneously missing. Listwise deletion therefore wasted valuable information. Moreover, it was highly unlikely these variables are missing completely at random (MCAR, the only case in which ignoring partially missing data does not bias results) because the missing observations tended to occur in the less developed and integrated countries of the world system, such as Myanmar and Mongolia. Listwise deletion therefore not only wasted information, but biased results. Meanwhile, it was also unlikely that missing values were missing not at random (MNAR, in which case the value of each missing variable is the only predictor of the same variable's missingness), meaning that it is theoretically possible to meaningfully predict missing values from other variables that may or may not be in the dataset.

The most reasonable method of imputing these missing values was multiple imputation. When complete observations are similar on most measurable variables to a partially missing observation, the missing value is better filled by looking at similar, complete observations than other observations. The partially missing value can therefore be better predicted from a linear regression or other statistical method run on the predictor variables (usually the other variables in the main model) than by using simple mean replacement or even hotdeck replacement. Because the data exhibited multiple overlapping patterns of missing data, I used multiple imputation chained equations (MICE) to fill in missing values. For more information on this reasoning and methodology, please see Appendix B.

Descriptive statistics for the data with missing values replaced by average imputations are presented in Tables 1 and 2 on the following pages.

Very quickly one realizes that common currency, with a mean almost equal to 0 and even the 99^{th} percentile at 0, has no meaningful variation; indeed, in preliminary versions of the study, it confounded significantly with the constant term in the regressions, and was thus removed from further consideration. All other variables in the model varied enough to meaningfully identify their effects and warranted inclusion. Many variables, particularly the indicators, were quite skewed, and although the dependent variable—*lntrade*—had kurtosis closest to 3 among the variables in the model, the kurtosis values were often quite distant from the normal distribution's kurtosis of three. There were no extraordinarily odd distributions, but the data's non-Gaussian nature, combined with the model's usage of fixed effects by country-year and imputed values, called for the usage of robust standard errors.

Table 1: Imputation Replacement Data Summary Statistics													
	Mean	sd	Skewness	Kurtosis	Minimum	1 %ile	10 %ile	25 %ile	Median	75 %ile	90 %ile	99 %ile	Maximum
lntrade	.3387232	(6.745121)	(-1.019832)	(3.096562)	-13.816	-13.816	-13.816	-2.3886	2.3545	5.0281	7.0373	10.275	12.951
lnDistance	8.237147	(.7747327)	(-.9081543)	(3.664877)	4.8810	5.9628	7.1753	7.7428	8.4132	8.8271	9.0752	9.4088	9.5001
border	.0714286	(.2575452)	(3.328201)	(12.07692)	0	0	0	0	0	0	0	1	1
lnPijt	3.223342	(.5564885)	(-1.418156)	(4.785342)	.40547	1.5041	2.3514	3.0445	3.4012	3.5835	3.7377	3.8918	3.8918
csl	.2103177	(.3374914)	(1.155636)	(2.564091)	0	0	0	0	0	.54290	.80705	.97020	.98260
cnl	.1648764	(.2942653)	(1.523543)	(3.741804)	0	0	0	0	0	.15510	.73150	.93100	.97020
LingProx	.4099341	(.3585473)	(.8917515)	(5.408574)	0	0	0	0	.46550	.61703	.76410	1.3727	2.5906
Rijt	.4024447	(.4049622)	(.2721713)	(1.266082)	0	0	0	0	.17466	.87120	.94100	.98256	.99680
comcur	.001542	(.0392383)	(25.4073)	(646.531)	0	0	0	0	0	0	0	0	1
wto	.2405896	(.4274512)	(1.213782)	(2.473267)	0	0	0	0	0	0	1	1	1
tr_agr	.6627664	(.4727761)	(-.6885718)	(1.474131)	0	0	0	0	1	1	1	1	1
leg_sys	.3774603	(.4847625)	(.5055773)	(1.255608)	0	0	0	0	0	1	1	1	1
colony	.2587302	(.437947)	(1.101847)	(2.214067)	0	0	0	0	0	1	1	1	1
N	22050												

Table 2: Imputation Replacement Data Correlations Matrix

	year	lntrade	lnDistance	border	lnPijt	csl	cnl	LingProx	Rijt	comcur	wto	tr_agr	leg_sys	colony
year	1													
lntrade	0.2336	1												
lnDistance	0	-0.167	1											
border	0	0.1091	-0.4437	1										
lnPijt	-0.1537	-0.3656	-0.2018	0.1373	1									
csl	-0.0009	0.0767	-0.4805	0.1541	0.2112	1								
cnl	-0.0008	0.0946	-0.4414	0.1708	0.1944	0.9457	1							
LingProx	0.0004	-0.0376	0.0873	0.0063	-0.0273	-0.6559	-0.6051	1						
Rijt	-0.0043	0.0028	-0.5754	0.1873	0.2735	0.582	0.5295	-0.1085	1					
comcur	0.0019	0.0343	-0.1154	0.1417	0.0153	0.0563	0.0644	-0.0449	0.0247	1				
wto	0.3479	0.293	0.0802	-0.0737	-0.3382	-0.0255	-0.0344	-0.0299	-0.0756	0.0347	1			
tr_agr	0.3503	0.0922	-0.0939	0.0418	-0.0251	0.1008	0.0983	-0.0701	0.0641	0.0256	0.1322	1		
leg_sys	0.0649	-0.0531	-0.3127	0.0826	0.1839	0.3679	0.3512	-0.0437	0.4093	-0.0306	-0.0714	0.0556	1	
colony	0	-0.033	-0.2809	0.0895	0.1918	0.2258	0.2333	-0.0961	0.2456	0.0665	-0.027	0.0355	0.2817	1

The strongest correlations were, as expected, among demographic proximity variables, although the exact nature of these correlations, such as the negative relationship between *LingProx* and the other demographic variables, was at first puzzling. In this particular case, as Melitz and Toubal point out in their explanation of these variables, *LingProx* is uninterpretable in the absence of *cnl* since it represents the linguistic proximity between countries' non-shared native language populations. Another important correlation to note is the strength of the relationship between *lnDistance* and demographic proximity variables. Other correlations of note were between time and *lntrade, lnPijt, wto,* and *tr_agr,* representing the fact that even this study's non-Western sample experienced significant globalization and liberalization; the weakness of correlation between time and *lnDistance, border, csl, cnl, LingProx,* and *Rijt;* and between *leg_sys* and *colony* on the one hand and between *leg_sys* and the demographic variables on the other. This last fact weakened the regression when legal system and colonial status were both included; since legal system adds little unique value that is not addressed by common culture and colonial status, and estimates using legal system or colony status were interchangeable, legal system was excluded from the published estimations. However, regression estimates including it are available upon request.

Summary statistics and correlations for the original data, pre-imputation, never differed drastically from the post-imputation data. They are included in Appendix B.

Methodology

The econometric model uses ordinary least squares (OLS) with a regression discontinuity design (RDD) to ascertain the presence of network effects in cultural barriers to trade. This method allows the regression to separate the relationship of demographic and physical distance variables to trade before an event that improves intercultural business and economic ties in a subset of the trading cultural blocs from the relationships after the event. The key, then, is finding an event that improves intercultural business ties directly for only a subset of the cultural blocs in question.

For the sake of robustness, I used two events in different parts of the data's chronological scope and with different methods of directly improving intercultural economic ties to ward off confoundment with other time-related factors. The first discontinuity corresponds to the establishment of diplomatic relations between China and Saudi Arabia in 1990; the second to Turkey's flotation of the lira's foreign exchange rate in 2001. These are useful because they represent a significant improvement in a subset of Middle Eastern countries' ease-of-doing-business.

Diplomatic ties, as shown by Rose (2007), significantly improve international trade, justifying the usage of the establishment of diplomatic relations between China and Saudi Arabia as a discontinuity. Meanwhile, the lira's flotation is a useful discontinuity on account of the smoother business operations that come with free foreign exchange markets. Unlike fixed exchange rates, floating rates do not artificially create foreign currency shortages and surpluses that discourage trade and investment in the proper sectors. Moreover, especially in Turkey's case, a fixed exchange rate foists dual responsibility over monetary and foreign exchange rates onto the central bank, signaling extensive government economic intervention (and probably mismanagement) (Fischer, 2001; Hanke, 2001; Turkey's real crisis, 2001). Eliminating these obstacles by floating the exchange rate therefore tends to integrate economies, even despite the associated exchange-rate risk.

It should also be noted that although the flotation of the lira, as a monetary policy, had significant ramifications for Turkey's balance of trade, this aspect of exchange rate flotation would not affect the bilateral trade flow (a sum of both imports and exports) between Turkey and any other country.

Furthermore, these two events occur roughly one- and two-thirds of the way through the chronological range of the data, providing enough data on both sides of the discontinuity for adequate predictive power.

A variable indicating whether an observation represents a bilateral trade flow prior to or after the discontinuity is interacted with the range of distance variables indicated previously. This allows separate identification of the impact of various geographic, political, and demographic trade barriers on trade between East Asia and the Middle Eastern region both before a limited direct improvement in trade relations and after that improvement gives businesses in both cultural regions time to learn from their transactions, diminishing the informal costs associated with intercultural international trade. I expect this significant improvement in intercultural economic relations to diminish the importance of information- and trust-based trade costs, and thus the coefficient on the demographic interaction terms should hold the opposite sign of their respective, plain demographic variable's coefficient (which means that the magnitude of the overall coefficient on the demographic proximity variable diminishes). Meanwhile, the interaction on the physical interaction terms should be insignificant.

Because international business operates in cycles and contracts limit short-term responses to most international events, it is expected that the effect of the discontinuity will take time to appear. There are therefore three econometric specifications for each RDD: the first includes a dummy equal to unity in the year of the event's occurrence, and 0 otherwise; the second includes a dummy equal to unity one year after the event, and 0 otherwise; the third includes a dummy equal to unity two years after the event, and 0 otherwise. These three specifications of each RDD provide additional robustness and insight into the duration of the international economic adjustment period.

To control for the multilateral resistance factors that are key to a theoretically sound gravity model, I include a time-varying fixed effect for each partner in a country pair (but not for the pair itself, as that would sweep away all variables associated with a country pair—namely everything in this model). This helpfully eliminates effects on trade deriving simply from changes in economic circumstances from year to year (such as long-run economic growth, or recession in a few countries), controls for the role of resource extraction in OPEC countries, and renders the inclusion of other monadic variables, such as a population's education level or size, or a country's trade infrastructure, GDP, or status as an island unnecessary. In total, 1,260 fixed effects were absorbed, with two "on" for any given observation (e.g. Saudi1990 and China1990).

The regression equation therefore looks as follows:

$$\begin{aligned}\ln X_{ijt} = {} & \beta_0 + \beta_1 \text{DISCONTINUITY}_{ijt} + \beta_2 lnDistance_{ijt} + \beta_3 \text{DISCONTINUITY}_{ijt} * lnDistance_{ijt} + \\ & \beta_4 \text{border}_{ijt} + \beta_5 \text{DISCONTINUITY}_{ijt} * \text{border}_{ijt} + \beta_6 lnP_{ijt} + \beta_7 \text{DISCONTINUITY}_{ijt} * lnP_{ijt} + \\ & \beta_8 csl_{ijt} + \beta_9 cnl_{ijt} + \beta_{10} LingProx_{ijt} + \beta_{11} R_{ijt} + \\ & \beta_{12} \text{DISCONTINUITY}_{ijt} * csl_{ijt} + \beta_{13} \text{DISCONTINUITY}_{ijt} * cnl_{ijt} + \\ & \beta_{14} \text{DISCONTINUITY}_{ijt} * LingProx_{ijt} + \beta_{15} \text{DISCONTINUITY}_{ijt} * R_{ijt} + \\ & \beta_{16} \text{wto}_{ijt} + \beta_{17} \text{tr}_{\text{agr}_{ijt}} + \beta_{18} \text{colony}_{ijt} + \beta_{19} FE_{it} + \beta_{20} FE_{jt} + \varepsilon_{ijt}\end{aligned}$$

Section V: Results

Table 3 below compares predictions for the sign of each variable with the actual sign results, while Tables 4 and 5 on the following pages display the full results of the main regressions.

Table 3: Parameter Predictions and Results				
Variable	**Baseline Term**		**Discontinuity Interaction**	
	Prediction	**Result**	**Prediction**	**Result**
constant	+	+		
DISCONTINUITY event	?	-*		
lnDistance	-	-**	0/no significance	-**
border	+	+**	0/no significance	0/-*
lnPijt	-	+	0/no significance	0
csl	+	-**	-	+ +
cnl	+	+**	-	-*
LingProx	+	+**	-	-*
Rijt	+	-	-	+**
wto	+	+		
tr_agr	+	-**		
colony	+	+**		
+ p<0.15 * p<0.10 ** p<0.05				

As a first remark, all specifications have high explanatory power, passing an F-test for goodness-of-fit and possessing adjusted $R^2 > 0.5$. This confirms the importance of a cultural gravity model in explaining trade patterns. Secondly, there is extreme consistency in results across lag periods, with the only variations in the sign of Saudi-China**cnl* and Saudi-China**LingProx* in lags 1 and 2, and the significance levels of a few coefficients, such as between Saudi-China**border* and Lira**border* or Saudi-China**csl* and Lira**csl.* This lends robustness to the results, messy as they are.

As Table 3 shows, the results broadly confirm theories from the literature. These results confirm that physical distance is a statistically significant drag on trade volumes, with a 1% increase in distance diminishing trade by as much as 1.97%, and that border contiguity is a significant boon. A common colonial relationship increases trade by around 67%.

Table 4: Discontinuity for establishment of Saudi-China ties in 1990						
	0 year lag (1990 RDD)		**1 year lag (1991 RDD)**		**2 year lag (1992 RDD)**	
	lntrade		**lntrade**		**lntrade**	
constant	6.838		1.100		7.959	
	(48.11)		(45.68)		(45.58)	
Saudi-China Relations Discontinuity	-3.304		1.882		-5.122*	
	(3.117)		(3.388)		(2.910)	
lnDistance	-1.890**		-1.932**		-1.917**	
	(0.180)		(0.171)		(0.162)	
Saudi-China*lnDistance	0.294+		0.366**		0.358**	
	(0.195)		(0.186)		(0.178)	
border	1.488**		1.498**		1.494**	
	(0.311)		(0.296)		(0.281)	
Saudi-China*border	-0.942**		-0.997**		-1.034**	
	(0.354)		(0.342)		(0.330)	
lnPijt	1.824		1.856		1.867	
	(13.41)		(13.37)		(13.35)	
Saudi-China*lnPijt	(collinearity omission)		(collinearity omission)		(collinearity omission)	
csl	-4.078**		-3.978**		-3.864**	
	(0.885)		(0.842)		(0.800)	
cnl	5.403**		5.011**		5.009**	
	(0.835)	F(4, 20775) = 38.09**	(0.795)	F(4, 20775) = 39.70**	(0.758)	F(4, 20775) = 41.78**
LingProx	1.768**		1.659**		1.760**	
	(0.371)		(0.354)		(0.337)	
Rijt	-2.868**		-2.859**		-2.746**	
	(0.352)		(0.337)		(0.323)	
Saudi-China*csl	1.031		0.928		0.793	
	(1.027)		(0.996)		(0.968)	
Saudi-China*cnl	-0.558		0.000234		0.0117	
	(0.962)	F(4, 20775) = 20.85**	(0.932)	F(4, 20775) = 24.23**	(0.906)	F(4, 20775) = 25.05**
Saudi-China*LingProx	-0.119		0.0380		-0.111	
	(0.424)		(0.410)		(0.398)	
Saudi-China*Rijt	3.501**		3.619**		3.593**	
	(0.408)		(0.396)		(0.387)	
wto	0.0664		0.0629		0.0610	
	(0.135)		(0.135)		(0.135)	
tr_agr	-0.161**		-0.160**		-0.162**	
	(0.0764)		(0.0764)		(0.0763)	
colony	0.677**		0.677**		0.678**	
	(0.0864)		(0.0864)		(0.0863)	
country-year fixed effects	(absorbed)		(absorbed)		(absorbed)	
N	22050		22050		22050	
R-sq	0.587		0.587		0.587	
adj. R-sq	0.562		0.562		0.562	
F	28.93**		28.89**		28.89**	
(Robust standard errors in parentheses)						
*+ p<0.15 * p<0.10 ** p<0.05*						

Table 5: Discontinuity for Turkey floating the lira in 2001

	0 year lag (2001 RDD)		1 year lag (2002 RDD)		2 year lag (2003 RDD)	
	lntrade		**lntrade**		**lntrade**	
constant	9.299		9.619		9.816	
	(45.33)		(47.66)		(45.33)	
Lira Float Discontinuity	-9.223**		-9.429**		-9.657**	
	(2.557)		(2.447)		(2.429)	
lnDistance	-1.937**		-1.901**		-1.871**	
	(0.112)		(0.108)		(0.105)	
Lira*lnDistance	0.628**		0.583**		0.550**	
	(0.142)		(0.142)		(0.142)	
border	0.777**		0.749**		0.723**	
	(0.210)		(0.204)		(0.200)	
Lira*border	0.0817		0.163		0.255	
	(0.290)		(0.290)		(0.289)	
lnPijt	1.903		1.903		1.912	
	(13.29)		(13.29)		(13.29)	
Lira*lnPijt	(collinearity omission)		(collinearity omission)		(collinearity omission)	
csl	-3.940**		-3.901**		-3.863**	
	(0.584)		(0.571)		(0.559)	
cnl	5.329**		5.310**		5.251**	
	(0.540)	F(4, 20775) = 62.12**	(0.529)	F(4, 20775) = 61.27**	(0.517)	F(4, 20775) = 60.92**
LingProx	1.799**		1.797**		1.772**	
	(0.240)		(0.234)		(0.228)	
Rijt	-1.698**		-1.480**		-1.317**	
	(0.242)		(0.236)		(0.230)	
Lira*csl	1.454+		1.465+		1.474+	
	(0.917)		(0.929)		(0.945)	
Lira*cnl	-0.727		-0.759		-0.665	
	(0.848)	F(4, 20775) = 27.54**	(0.858)	F(4, 20775) = 23.31**	(0.873)	F(4, 20775) = 20.82**
Lira*LingProx	-0.289		-0.308		-0.264	
	(0.365)		(0.369)		(0.375)	
Lira*Rijt	3.221**		2.928**		2.732**	
	(0.355)		(0.358)		(0.362)	
wto	0.0550		0.0547		0.0538	
	(0.135)		(0.135)		(0.135)	
tr_agr	-0.157**		-0.151**		-0.150**	
	(0.0764)		(0.0764)		(0.0765)	
colony	0.679**		0.678**		0.677**	
	(0.0862)		(0.0863)		(0.0863)	
country-year fixed effects	(absorbed)		(absorbed)		(absorbed)	
N	22050		22050		22050	
R	0.587		0.586		0.586	
adj. R-sq	0.561		0.561		0.561	
F	29.05		29.04		29.03	

(Robust standard errors in parentheses)

+ p<0.15 * p<0.10 ** p<0.05

The results also tentatively confirm this research paper's hypotheses. Not only are all cultural proximity variables critically significant at baseline, but all their discontinuity interaction terms (with the exceptions of *cnl* and *LingProx* in lags 1 and 2) carry the opposite sign of the baseline and are jointly significant; this means that although a 1% -point increase in the proportion of populations that natively speak the same language increases trade volumes by as much as 540%, an event that brings businesses into contact between a subset of the Middle East and East Asia attenuates this effect, knocking off 75% of that impact. This relationship holds across lags, with only slight changes in the precise nature of the relationship, and across both the establishment of Saudi-Chinese relations in 1990 and the flotation of the Turkish lira in 2001.

Political relationships were so insignificantly affected by the discontinuity event that the DISCONTINUITY**lnPijt* terms were always omitted due to multicollinearity, presumably with the fixed effects and baseline *lnPijt.* Likewise, Lira**border* was insignificantly different from 0. This fits my prediction that non-cultural variables would not be heavily impacted by the intercultural economic event.

As the highlighted sections of Table 3 show, there are also clearly some unpredicted results that require explanation. WTO membership seems to have little impact on trade, while a trade agreement correlates with significantly diminished trade (as much as 16.2%). A 1%-point increase in the proportion of two countries' populations that speak the same language or that follow the same religion correlates with as much as 408% and 287% less trade, respectively, while an event of intercultural business importance seems to attenuate this affect by as much as 147% and 360%, respectively. Moreover, the event seems to attenuate the dissuasive power of physical distance on trade by as much as 0.6%, more than a third of distance's original impact.

The key to understanding these odd results lies in a few data curiosities, first regarding the scope. The negative correlation of trade agreements with trade volumes may be explained by the fact that many countries in sample lack fruitful trading partners within the sample, and instead sign trade agreements designed to facilitate supply chains for a more powerful, external country—such as the United States signing trade agreements with Japan, South Korea, and Taiwan. Likewise, religious similarity's salutary effect on trade would have been underestimated due to the exclusion of economically massive trading partners closer to one cultural bloc than another, such as the European Union, which is undeniably closer to the Middle East. Such omitted economies, whose size is necessarily uncontrolled for since they are excluded from study, deflect trade away from intra-cultural trading partners that seem otherwise poised to be prime trading partners based on cultural proximity and physical distance. This flaw would misattribute the lack of intra-religious trade to the religious similarity of two countries rather than their mutual physical proximity to more advanced economies.

Table 2 points to the third issue. The high correlation of the demographic variables with physical distance makes separate identification difficult. As a result, the DISCONTINUITY**lnDistance* terms are statistically significant and confound with the demographic discontinuity interactions. It also makes some sense that *Rijt,* in this study's scope, is negatively associated with trade volumes. Helble (2007) found that Buddhist countries are slightly discouraged from intra-religious trade.

Combining the variable correlations, the high-dimensional fixed effects, and unique attributes of the limited country scope, it is a wonder that the demographic-discontinuity interaction terms so consistently yielded coefficients carry the opposite sign of their baseline with joint significance.

At the same time, one should not dismiss the fact that in nearly every case—even where the baseline coefficient bucked the theoretical prediction—the demographic-discontinuity interaction terms carried the opposite sign of their corresponding baseline term, with the intercultural business discontinuity thus attenuating whatever effect of cultural proximity previously prevailed. This clearly indicates consistent network effects. Rather than diminishing the power of demographic similarity to encourage trade (or the power of demographic distance to discourage trade), improvement in economic ties between subsets of cultural blocs simply seems to make culture less relevant trade overall, both between and within each cultural bloc. In other words, demographic barriers move closer to having no effect on trade, no matter where they started.

Section VI: Conclusion

This study tentatively indicates that there are network effects in trade between cultural blocs such that small investments in intercultural trade overall attenuate effect of demographic similarity on trade. The effect holds true regardless of whether cultural similarity was originally a boon or drag on trade; the increase in intercultural business puts the two cultural blocs in question on an overall more equal playing field. Moreover, the international response to foreign business acumen is far quicker than one might expect given contractual rigidity and learning curves. One explanation lies in rational expectations, but a more likely explanation is the "fail fast, then scale up" attitude demonstrated in Barkema and Drogendijk (2007).

A larger sample—accounting for all relevant dyads and increasing the number of observations per coefficient—is necessary for a more definitive attribution of these network effects to separately predict the effect of intercultural business on cultural trade barriers from its effect on other trade barriers. It may be entirely possible that network effects exist in all barriers.

Implications

Trade theorists should reconsider the underlying assumption in gravity theory that actors choose to trade with each other independent of the other trade relationships in their network, since this study presents evidence that directly contradicts that assumption. Trade policymakers, meanwhile, have a new tool to deal with the economic implications of the "clash of civilizations." Rather than write off intercultural economic relations and focus inward or work to outcompete other cultures, policymakers can prioritize economic relationships with those foreign countries that are central to their cultural bloc's economy and simultaneously are more inclined to do business with the policymakers' home country. The returns to such trade will accrue to economic relations with other members of that bloc as well.

Future Study

This study had numerous flaws that future research can and should address. The first broad category is data-related. Obviously complete data would eliminate the trade-off of information and bias inherent to missing data analysis. The acquisition of reliable, standardized ethnicity data would add greatly to the granularity of cultural analysis, as would time-variant data on language. Future researchers could add indicator variables for cultural bloc, as well. Such an addition would be required to expand the RDD approach to a larger scope spanning all dyads in the global trading network, since the discontinuity would need to be limited to countries in one of the cultural blocs affected by the economic event. As the discussion of unexpected results for the effect on trade of religion, trade agreements, and other variables made clear, a scope that sections off large parts of the world is also subject to much error.

Another fruitful avenue of research would be measuring network effects with an entirely different method than RDD. An RDD only estimates the regression across two time periods, and presumes an event has exogenous effects on intercultural business. A future study may try a different approach less vulnerable to confoundment with other chronological effects, such as interacting physical, political, and demographic distance variables with the sum of the previous five years' bilateral trade volumes. This would test a different but related question of whether there are increasing returns in intercultural trade to overall intercultural trade, rather than whether the development of conduits through cultural barriers improves overall intercultural trade. Alternatively, the RDD approach could be maintained, but on a global scale.

Although this study lends further credence to Armington's (1969) "home bias" and the recent literature that home bias derives from both physical and cultural distance, it also warns of two problems in the literature around the gravity model of trade. Firstly, case studies excluding large economies should no longer be pursued. Secondly, the gravity model's assumption that decisions to trade parcels between two economies are independent of all other decisions (Savage and Deutsch, 1960) must be reexamined.

Appendix A

lntrade

Trade data in the Correlates of War project's *International Trade* dataset was only recorded as zero if the importer and the exporter both reported zero trade in both directions in a given year to the IMF and every other source consulted for compiling the data set. If all simply did not report data, trade was labeled missing. I therefore safely assumed zero-trade values to in fact be indistinguishable from zero and replaced these values with 0.000001—that is, $1.00—to permit a logarithmic transformation as the gravity model specifies (cf. leaving zero-trade: ln(0) = {}).

Rijt

Raw data on religious composition of countries across the world came in five-year intervals between 1945 and 2010 as the proportion of the population of a given country following each religious sect or religious grouping in a given year. First, I duplicated each religious proportion value for the next four years to have annual data between 1980 and 2014. Next, I kept data on proportions following Christianity, Judaism, Islam, Buddhism, Hinduism, Zoroastrianism, Taoism, Confucianism, and Shintoism, and set groups with less than 3% of a population to 0%. Past papers used a 4% or 5% cutoff to avoid overly granular data that make calculations difficult and prone to outlier data points unrepresentative of religious similarity, but 3% better measures differences in national culture owing to minority groups—for example, a 4% or 5% cutoff would imagine the United States to have never had a Jewish or Muslim presence, despite these minorities' significant role in modern American culture compared to otherwise similar countries in modern Europe. I merged these proportions to the master dataset by year *t* and country *i* and by year *t* and country *j*, then multiplied the proportion of country *i* following a religion in year *t* by the proportion of country *j* following the same religion in year *t*. Summing across religions, for each observation, provides a number roughly representing the chance that a random individual from country *i* and a random individual from country *j* would share any religion in year *t*.

There were two issues with this measure. The first is dual religion. *Rijt* is not truly a probability of shared religion; it can theoretically be larger than 1, e.g. everyone in both countries follows the same two religions. Luckily, dual religiosity was only a major occurrence in Japan, where many are Buddhist and Shintoist, and China, where many follow a syncretic custom in addition to Buddhism or Taoism; syncretism was excluded from *Rijt* on account of its inconsistency across borders.

A more significant structural issue was Islamic sectarianism. It became clear that the damage done to *Rijt* by counting differences between Shi'a, Sunni, and Ibadi populations on a par to those between Buddhists and Christians would be far greater than that done by ignoring sectarian differences. Much modern Islamic sectarianism is, in any case, geopolitical rather than cultural in nature; *lnPijt* and the fixed effects partly control for this.

lnPijt

The joint authoritarianism value derives from scores on political rights and civil liberties for each country and territory in the world (with 1 the most free and 7 the most authoritarian), 1973-2018, reported by Freedom House. From 1981-1989, survey data did not correspond to the calendar year; instead, there were eight samples covering these nine years. The 1981 survey period extended past 1981 to August 1982; the 1983 survey period extended from August 1982 through November 1983. The next seven survey periods ran November-November until a return to survey periods matching calendar years in 1990. I set these survey periods to the year of which they covered a majority, which left 1982 blank. I therefore created 1982 observations for all countries by averaging the 1981 and 1983 scores for political rights and civil liberties, respectively.

After reshaping the data from lists of political and civil scores by year for each country into a list of country-year observations with a political and civil variable and merging this data into the dyadic dataset, I averaged the political rights and civil liberties scores to create composite "freedom indices" for country *i* in year *t* and country *j* in year *t*. Multiplying these two freedom indices for each member country of a dyad yielded a joint freedom score.

Appendix B

Rubin (1976), Little and Rubin (2002), Schafer & Graham (2002), Allison (2002), and Enders (2010) provide justification for using multiple imputation to avoid losing information or biasing results. My data’s missingness patterns are described in Tables B1 and B2.

Table B1: Missing Data Summary		
Variable	**# missing observations**	**# complete observations**
lntrade	2,446	19,604
csl	2,415	19,635
cnl	2,415	19,635
LingProx	4,487	17,563

Table B2: Missing-value Patterns				
	Pattern (1 means complete, 0 means missing)			
Percent	**cnl**	**csl**	**LingProx**	**lntrade**
76%	(Complete)			
8	0	0	0	1
5	1	1	0	1
4	1	1	1	0
4	1	1	0	0
3	0	0	0	0
100%				

I imputed 100 times to get a stable average imputation for each missing value, using (in addition to *lnDistance, border, lnPijt, Rijt, wto, tr_agr, leg_sys,* and *colony*, the key variables from the model) GDP per capita for *lntrade* (and any available data on GDP per capita for that country in other pairings and years to predict the occasional missing GDP per capita value) and a dummy of common ethnic language spoken by at least 9% of the population of both countries in a dyad for *csl, cnl,* and *LingProx;* both of these variables are from CEPII's gravity dataset. I chose to use the regression multiple imputation method rather than simple variable mean or hotdeck replacement because multiple imputation better fits missing values into the spectrum of the data; meanwhile, I did not use logit imputation even to predict the probabilistic *csl, cnl,* and

LingProx because they are continuous dependent variables (in the context of the imputation model).

The established *mi estimate:* command to combine the main model's specified regressions run on each complete set did not work with high-dimensional fixed effects; meanwhile, simply running my main regressions on all imputation-completed datasets together would bias standard errors downward by pretending the dataset contained 2,205,000 observations instead of 22,050. I therefore calculated the average of the 100 imputed values for each case where the original value was missing and used these average imputations as replacements for the missing one.

Some of the original 100 imputed values of *csl, cnl,* and *LingProx* were negative because the imputation model was linear, without a minimum possible imputation. However, less than 5% of imputations were problematic in this way, and, after replacing missing values with average imputations, no observations' values presented this problem; it was therefore unnecessary to make any case-by-case adjustments. Similarly, some imputations of *lntrade* were arbitrarily low (e.g. -20, indicating bilateral trade at $0.000000001 million = $0.001), but this was not a problem because, like the $1 stand-in for zero-trade, this imputation simply represents trade values equivalent to zero.

The pre-imputation descriptive statistics are presented in Tables B3 and B4.

Table B3: Original Data Summary Statistics													
	Mean	sd	Skewness	Kurtosis	Minimum	1 %ile	10 %ile	25 %ile	Median	75 %ile	90 %ile	99 %ile	Maximum
lntrade	.6349508	(7.047284)	(-1.116669)	(3.087995)	-13.816	-13.816	-13.816	-1.3271	2.9546	5.3155	7.2565	10.35361	12.95123
lnDistance	8.237147	(.7747327)	(-.9081543)	(3.664877)	4.8810	5.9628	7.1753	7.7428	8.4132	8.8271	9.0752	9.408824	9.500148
border	.0714286	(.2575452)	(3.328201)	(12.07692)	0	0	0	0	0	0	0	1	1
lnPijt	3.223342	(.5564885)	(-1.418156)	(4.785342)	.40547	1.5041	2.3514	3.0445	3.4012	3.5835	3.7377	3.89182	3.89182
csl	.234544	(.3499228)	(.9794841)	(2.177944)	0	0	0	0	0	.59780	.84550	.9702	.9825968
cnl	.1835396	(.3065396)	(1.346859)	(3.209634)	0	0	0	0	0	.37720	.75460	.931	.9702
LingProx	.3863411	(.3932319)	(1.017686)	(4.898604)	0	0	0	0	.41052	.63916	.76410	1.372655	2.590621
Rijt	.4024447	(.4049622)	(.2721713)	(1.266082)	0	0	0	0	.17466	.87120	.94300	.9825625	.9968014
comcur	.001542	(.0392383)	(25.4073)	(646.531)	0	0	0	0	0	0	0	0	1
wto	.2405896	(.4274512)	(1.213782)	(2.473267)	0	0	0	0	0	0	1	1	1
tr_agr	.6752927	(.4682794)	(-.7486896)	(1.560536)	0	0	0	0	1	1	1	1	1
leg_sys	.3774603	(.4847625)	(.5055773)	(1.255608)	0	0	0	0	0	1	1	1	1
colony	.2587302	(.437947)	(1.101847)	(2.214067)	0	0	0	0	0	1	1	1	1
N	22050												

Table B4: Original Data Correlations Matrix

(correlations among complete observations)

	year	lntrade	lnDistance	border	lnPijt	csl	cnl	LingProx	Rijt	comcur	wto	tr_agr	leg_sys	colony
year	1													
lntrade	0.2627	1												
lnDistance	0.0066	-0.1113	1											
border	-0.0043	0.0744	-0.4352	1										
lnPijt	-0.0922	-0.3577	-0.2672	0.1664	1									
csl	-0.0111	-0.023	-0.4822	0.1418	0.2813	1								
cnl	-0.015	0.0039	-0.4388	0.1525	0.261	0.9531	1							
LingProx	0.0075	0.02	0.0829	0.0159	-0.0484	-0.6533	-0.6069	1						
Rijt	-0.0291	-0.0992	-0.5804	0.1801	0.3645	0.5666	0.5265	-0.0786	1					
comcur	0.001	0.0321	-0.1214	0.1522	0.0202	0.0542	0.0619	-0.0433	0.0218	1				
wto	0.3484	0.2786	0.1105	-0.1057	-0.3266	-0.0463	-0.0557	-0.024	-0.1001	0.0374	1			
tr_agr	0.3501	0.0899	-0.1015	0.0432	0.0115	0.1102	0.1018	-0.0745	0.0615	0.0285	0.1344	1		
leg_sys	0.0588	-0.1145	-0.3221	0.0736	0.2164	0.3487	0.3481	-0.0221	0.3922	-0.0379	-0.065	0.0615	1	
colony	0.0043	-0.044	-0.3258	0.0954	0.1712	0.2333	0.2447	-0.0908	0.2498	0.0744	-0.0503	0.0401	0.3239	1

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