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Democracy and trade: an empirical study

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Abstract The theoretical discussion on globalization has suggested that there are linkages between democracy and trade, although the direction of influence is less certain. Formal empirical studies remain scarce, and have often focused on the question of whether democratic regimes influence trade policy, as opposed to the actual relationship between democracy and trade. This paper seeks to answer the question, "Do democracies trade more?" by applying the gravity equation to a large dataset of bilateral trade data for the period 1948–1999, while taking into account the role of democracy. It finds that democracy is positively related to trade flows, but only after controlling for trade pair heterogeneity. In addition, it makes the case for studies of this nature to draw a distinction between trade flows in the pre- and post-1990s period of rapid democratization as well as between developed and developing countries.

Keywords Democracy · Trade · Gravity model

JEL Classification F13 · P51

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> The crossroads of trade are the meeting place of ideas, the attrition ground of rival customs and beliefs; diversities beget conflict, comparison, thought; superstitions cancel one another, and reason begins.
>
> *The Life of Greece* (Will Durant)

1 Introduction

Democracies have been an irresistible force in world affairs over the post-war period since the 1950s. At the dawn of the second millennium, there are approximately 3.7 billion people living in 120 (self-declared) democratic states, more than six times the number at the turn of the previous century. Democracies have often been credited with fostering a greater degree of involvement and ownership by individual citizens in the political process, sustaining peaceful diplomatic relations between countries (Ray 1998), and even improving national welfare by relieving the likelihood of famine (Sen 1999). It is natural, therefore, to ask how democracies perform in the face of the other major force that has been pervasive over the post-war period, that of economic globalization. And nowhere do we see global integration more richly expressed than in the phenomenon of international trade in goods and services.

This paper seeks to answer the basic question, "Do democracies trade more?" This research direction allows us to abstract from the interesting, but more complex, endogeneity and causality issues that arise when attempting to study the effects of democracy on trade. Instead, the analysis allows for an accounting of whether the debates surrounding free trade and democracy are even justified, and if so, whether these arguments have taken into account empirical realities pertaining to the issue. As a result, the paper will also be able to inform the existing policy debate.

Yet despite the maelstrom generated in the popular press on this topic, academic research on the links between democracy and trade remains somewhat limited. While the empirical literature on the effects of both democracy on economic growth as well as trade on economic growth is large and flourishing,[1] little has been done in terms of studying the empirical relationship between democracy and trade.

This is not for lack of a theoretical basis, however. The literature on endogenous tariff formation (Mayer 1984) predicts that trade policy formulated under the environment of direct democracy follows the preferences of the median voter; while extending this to a representative democracy yields an equilibrium tariff that is a weighted mean of voters' individually optimal tariffs (Yang 1995). In either case, research anticipates that politically-influenced governments will, as democracy advances, increasingly respond to the desired tariff rates of the electorate. Consider, in a Heckscher-Ohlin world, a relatively labor (capital) abundant country for which the initial selectorate consists of a large fraction of capital (labor) owners. Suppose that this body is then gradually eroded as democratization expands the proportional weight of the relatively abundant non-capital (non-labor) owning class. Vote-maximizing governments will find that high tariff rates—even when fully redistributed back to voters—no longer

[1] See Tavares and Wacziarg (2001) and Frankel and Romer (1999) for recent examples of each.

compensate the income loss due to protection. The result is an increasing bias toward a trade policy that maximizes electorate welfare, and hence one that maximizes the gains from trade. In this case, democracy unambiguously spurs trade.

More recent work on the political economy of protection (Grossman and Helpman 1994) tells a somewhat different story. If rational policymakers maximize a weighted sum of campaign contributions and general welfare, the equilibrium tariff depends on the relative weights placed on each in the government's objective function. To the extent that special interest groups are more active in a democracy (Olson 1982), they might constitute a greater weight, and therefore a greater level of democracy would lead to higher trade barriers. Conversely, political competition generated in an active democracy might imply that policymakers weight more heavily general versus special interest welfare. These models are silent as to which influence might dominate; however, empirical work testing the protection for sale model has yielded results that support a positive linkage between democracy and trade (Mitra et al. 2002).

Nonetheless, the discussion above overlooks the actual relationship between democracy and trade flows. Needless to say, trade policy need not translate directly to actual trade volumes, since the former is primarily a government-induced policy decision while the latter, a private one. While one would expect a high correlation between trade policy and actual trade outcomes, it is nonetheless interesting to examine the actual real value of trade between states, and to see if democracy plays a role there.[2]

The few empirical papers that have studied this direct effect include the work of Dixon and Moon (1993), who analyze the effect of joint democracy on US exports; Morrow et al. (1998), who, using data for major powers over 1907–1990, test three competing arguments of the effects of international politics on trade flows, one of which is a joint democracy hypothesis; Mansfield et al. (2000), who analyze the effects of alternative democratic regime characteristics on trade flows for members of the interstate system [as classified by Singer and Small (1994)] for 5-year periods between 1960 and 1990; and Bliss and Russett (1998), who assess trade in a yearly fashion for 1962 through 1989, using bilateral dyads for the world's top 14 exporters, each with differing degrees of democratic political institutionalism. All find that democracy increases trade.

This research paper contributes to the existing literature on trade policy in three ways. First, it utilizes a very large set of trade data that is not restricted to US trade with other countries, but bilateral trade between these countries as well. Second, the dataset employed is also very long: Observations begin in 1948 and conclude with data up to (and including) the year 1999. In addition, it considers both binary as well as quantitative measures of democracy, as adapted from the *Polity IV* dataset (Marshall and Jaggers 2003). Third, it exploits panel regression techniques to estimate the full

[2] Some recent papers that have examined the indirect channel of democracy on trade policy are Adserà and Boix (2002), who study the effects of democracy on both trade policy as well as the size of the public sector; Mansfield et al. (2002), who present a model that relates PTA formation with democracy; Polachek (1997), who considers the mitigating effect of democracies on conflict via trade, and the papers by Eichengreen and Leblang (2006), Milner and Kubota (2005), and O'Rourke and Taylor (2006), all of which directly test the linkages between democracy and trade policy via measures such as trade openness or the level of tariff protection.

regression, and hence provides a richer analysis that also takes into account country heterogeneity.

The remainder of this paper is organized as follows. Section 2 describes the econometric model used for the present study, as well as the dataset. This section is followed by estimation results (Sect. 3) and a range of extensions and robustness checks (Sect. 4). A final section concludes and provides suggestions for future research.

2 Econometric model and data description

The workhorse econometric model used for this paper is the gravity model. The gravity model is a natural candidate for examining trade flows and how these might be affected by democracy. The basic prediction of the gravity model—that trade between two nations varies proportionally to the (economic) size of these countries and inversely to their distance—is one of the most enduring relationships in empirical economics. As a result, it has been used to explore a range of phenomena. These include the extent to which national borders matter in trade (McCallum 1995), the effects of a common currency on trade (Rose 2000), the role of international institutions in promoting trade flows (Rose 2005), the differences between competing theories of international trade (Feenstra et al. 2001), and the patterns of sovereign debt and lending (Rose and Spiegel 2004). In this respect, the present paper does not depart too far from the existing empirical literature on the determinants of trade flows.

The benchmark gravity model used was of the following form:

$$\begin{aligned}\ln\left(T_{ijt}\right) = \alpha + \beta_1 \ln\left(Y_i Y_j\right)_t + \beta_2 \ln\left(\frac{Y_i}{N_i} \cdot \frac{Y_j}{N_j}\right)_t + \beta_3 \ln D_{ij} \\ + \mathbf{DEMOC}_{ijt}\boldsymbol{\theta} + \ln \mathbf{X}_{ij}\boldsymbol{\delta} + \ln \mathbf{Y}_{ijt}\gamma + \varepsilon_{ijt},\end{aligned} \tag{1}$$

where T_{ijt} denotes the mean real value of bilateral trade between state i and state j at time t, Y_i is real GDP of state i, N_i is its population size (and hence $\frac{Y_i}{N_i}$ is a measure of state i real GDP per capita), D_{ij} is the great circle distance between i and j, and $\boldsymbol{X}_{ij}$ and $\boldsymbol{Y}_{ijt}$ are vectors of time invariant and time dependent controls that influence bilateral trade, respectively.[3] The error terms ε_{ijt} are assumed to be distributed i.i.d. $N\left(0, \sigma_\varepsilon^2\right)$, and the key variable of interest, DEMOC_{ijt}, is variously taken to be:

$$\mathbf{DEMOC}_{ijt} = \begin{cases} ONEDEMOC_{ijt} + BOTHDEMOC_{ijt} \\ \ln\left(DEM_i \cdot DEM_j\right)_t \end{cases}, \tag{2}$$

[3] The controls employed in this study include: Time variant binary dummy variables for free trade agreements, currency union, and current colony status; time invariant binary dummies for contiguity, common language, landlocked countries, island nations, land masses, common colonial occupier, common colonial history, and common nation status; and a continuous time-variant variable for trade openness. The control variables as well as data sources are discussed in fuller detail in the appendix.

Table 1 Descriptive statistics

	Both democratic	Both nondemocratic
Log real trade	11.724	9.257
	(3.24)	(3.06)
Log real GDP	49.432	47.356
	(2.52)	(2.21)
Log real GDP/capita	16.946	15.025
	(1.38)	(1.42)
Log distance	8.208	7.920
	(0.88)	(0.88)
N	44,912	45,984

Standard errors are reported in parentheses

where $ONEDEMOC_{ijt}$ ($BOTHDEMOC_{ijt}$) is an indicator variable that take on unity when one country (both countries) of the two-country pair i and j is a democracy at time t, and zero otherwise, and DEM_i is a continuous variable for the level of democracy prevailing in country i, and $DEM \in [0, 10]$. Note that since the data are for country pair observations, we restrict the coefficients of either permutation (i's trade with j or j's trade with i) to be equivalent.

The trade data are drawn from the International Monetary Fund *Direction of Trade* statistics. The data cover bilateral trade between 217 IMF country codes between 1948 and 1999.[4] Controls were obtained from the World Bank *World Development Indicators*, the CIA *World Factbook*, the World Trade Organization *Annual Reports*, the Penn World Tables, and the IMF *Annual Report of Exchange Rate Arrangement and Exchange Restrictions*. Missing observations, where possible, were substituted with comparable equivalents from either the Penn World Tables, the IMF *International Financial Statistics*, or the *Statesman's Yearbook*. The democracy variable is adapted from the *Polity IV* dataset (Marshall and Jaggers 2003).

3 Data estimation and results

We begin with a statistical description of the data. We first consider the case where democracy is treated as a binary yes/no variable. The sample sizes for when both countries are democracies versus when both are not are roughly comparable (44,912–45,984). The means for some key variables are summarized in Table 1.

Interestingly, country pairs in which both countries are democratic display a larger mean value for the logarithm of real trade, as compared to country pairs in which both countries are non-democratic. However, due to the relatively large standard deviations, these are unlikely to be statistically distinct. Indeed, this result might entirely be driven by the relatively higher wealth levels in democratic nations (compare the means of log GDP per capita in the two cases).

[4] Note that IMF country codes may not refer to the typical Westphalian sovereign state: Other than the usual suspects, these codes also include independent territories, colonies, overseas departments, and newly independent states of former countries.

Table 2 Cross correlations of key variables

	Log real trade	Log real GDP	Log real GDP/capita	Log distance
Both democratic				
Log real trade	1.000			
Log real GDP	0.767	1.000		
Log real GDP/capita	0.548	0.480	1.000	
Log distance	−0.355	−0.028	−0.144	1.000
Both nondemocratic				
Log real trade	1.000			
Log real GDP	0.470	1.000		
Log real GDP/capita	0.333	0.413	1.000	
Log distance	−0.148	−0.363	−0.136	1.000

Selected variables reported. All correlations were significant at the 1% level

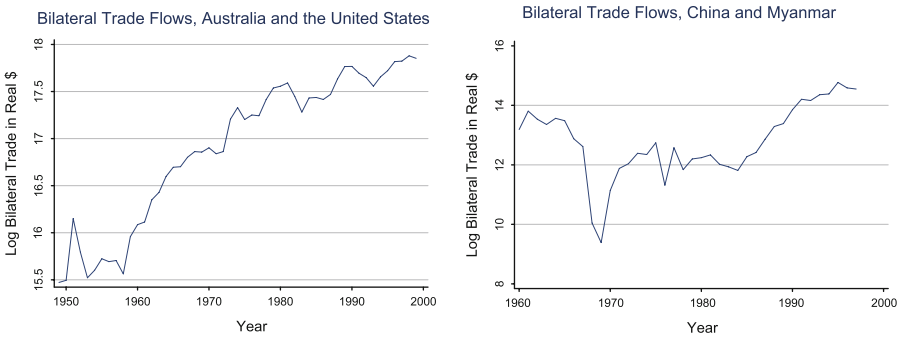

Fig. 1 Trade flows between both democratic and both nondemocratic trading pairs

Further insight into this relationship can be seen by comparing cross correlations (Table 2). Evidently, the correlation between economic size and trade flows is stronger for democratic trading pairs compared to nondemocratic pairs—more than one and a half times stronger. However, these simple correlations mask time-series effects; after all, trade exploded worldwide after the second World War.

For instance, consider the trading relationship between the United States and Canada, two countries with a long history of strong democratic rule, and sharing geographical proximity. Over the postwar period, the most distinct feature concerning average trade flows between the pair is the clear rising trend: Average trade flows were $74.46 million in 1948 (in constant 1984 US dollars), and this peaked at $1.1 billion in 1999 (Fig. 1a).

Next, consider the trading relationship between the following two nondemocratic countries—China and Myanmar—similarly located in geographical proximity to each other. Average merchandise trade between the pair exhibit considerably more variation: Trade plunged following Mao's Cultural Revolution in 1967 (finding its nadir at $0.01 million in 1969), before rising through most of the 1980s and 1990s. By the end of the 1990s, trade had reached new highs of more than $2 million a year (Fig. 1b).

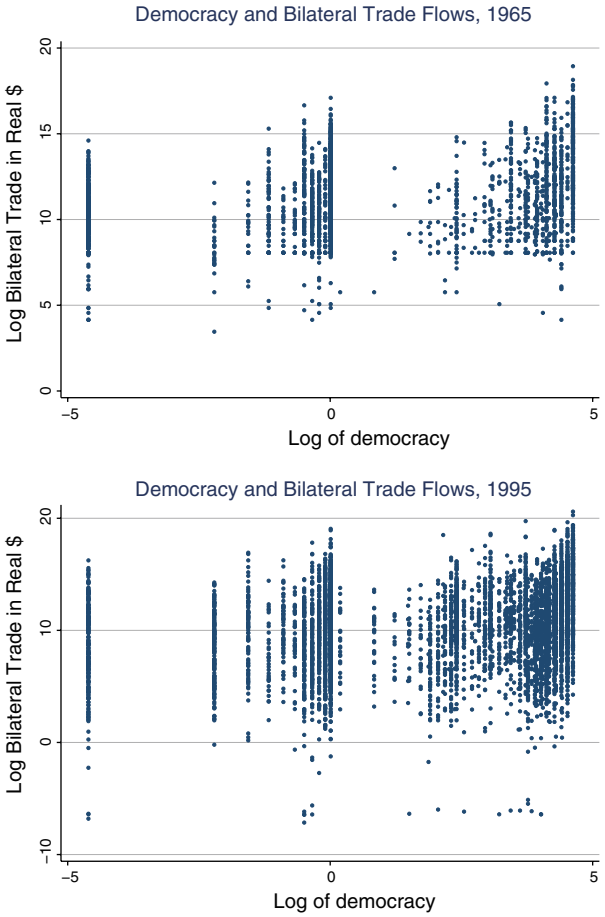

Fig. 2 Relationship between democracy and trade, 1965 and 1995

We now move on to examine the descriptive statistics for the case where democracy is treated as a continuous term. Simple scatter plots of the data reveal no distinct patterns. The graphs of the value of bilateral trade against the continuous democracy variable for the years 1965 and 1995 are shown in Fig. 2 below. This preliminary analysis thus hints to the possibility that, contrary to the existing empirical literature, there seems to be no relationship between democracy and trade.

This conclusion may be premature, however. In particular, the graphs only display a snapshot of patterns in the data. In order to yield more meaningful conclusions, as well as exploit the richness of the panel dataset, we proceed to more rigorous empirical analysis.

Table 3 displays the mixed model estimates for: (*P1*) The binary democracy variable as regressor using the fixed effects model;[5] (*P2*) The random effects model with a GLS

[5] Fixed effects are introduced for countries in a given trading pair.

Table 3 Mixed model regressions for bilateral trade flows and binary democracy variable

	(*P1*)	(*P2*)	(*P3*)	(*P4*)	(*P5*)	(*P6*)	(*P7*)	(*P8*)
Log real GDP	0.326	0.694	0.275	0.665	0.320	0.686	0.325	0.322
	(0.03)***	(0.01)***	(0.06)***	(0.03)***	(0.06)***	(0.02)***	(0.06)***	(0.06)***
Log real GDP	0.255	0.198	0.246	0.199	0.235	0.196	0.243	0.281
per capita	(0.05)***	(0.02)***	(0.07)***	(0.03)***	(0.07)***	(0.03)***	(0.08)***	(0.07)***
Log distance		−1.255		−1.254		−1.257		
		(0.04)***		(0.04)***		(0.04)***		
Both democracies	0.139	0.068	0.134	0.066	−2.206	−1.220	0.138	0.946
	(0.02)***	(0.02)***	(0.03)***	(0.03)**	(0.65)***	(0.59)**	(0.03)***	(0.45)***
One democracy	0.019	0.025	−3.162	−1.669	0.024	0.030	−0.211	0.013
	(0.03)	(0.03)	(1.02)***	(0.87)*	(0.05)	(0.04)	(0.60)	(0.05)
One democracy			0.065	0.035				
× GDP			(0.02)***	(0.02)**				
Both democracies					0.047	0.026		
× GDP					(0.01)***	(0.01)**		
One democracy							0.015	
× GDP per capita							(0.04)	
Both democracies								−0.049
× GDP per capita								(0.03)*
R^2	0.049		0.049		0.049		0.049	0.049
χ^2		15,312		7.97E+06		8.01E+06		
N	54,654	54,654	54,654	54,654	54,654	54,654	54,654	54,654

Huber-White (robust) cluster-adjusted standard errors reported in parentheses
* Significance at 10% level
** Significance at the 5% level
*** Significance at the 1% level. Only selected controls are reported, although all variables discussed in the data appendix were included

estimator for the binary democracy variable; (*P3*)–(*P4*) The specifications in (*P1*) and (*P2*), respectively, with GDP interacted with the dummy for one democracy as an additional control; (*P5*)–(*P6*) The specifications in (*P1*) and (*P2*), respectively, with GDP interacted with the dummy for both democracies; (*P7*)–(*P8*) The specification in (*P1*) with GDP per capita interacted with the dummy for one democracy and both democracies, respectively.

Although both fixed as well as random effects models were estimated, Hausman tests indicate that the fixed effects model is preferred ($\chi^2 = 2009.2$, $p = 0.000$). However, since fixed effects necessitates the exclusion of the time-invariant distance variable—an important control in the gravity model—we report both specifications for our results for (*P1*)–(*P6*). To economize on space, specifications (*P7*) and (*P8*) report only the estimates for the fixed effects model, although there were no qualitative differences for the corresponding random effects estimates.

The results in Table 3 are in line with that of earlier studies. Consider first specifications (*P1*) and (*P2*). The dummy for when both trading partners are democracies

is significant and positive, indicating the fact that democracies tend to trade more with one another. Although the dummy for one democracy is also positive, it is insignificant in both specifications. Likewise, the coefficients for the both democracies dummy is also positive and significant for specifications (*P3*)–(*P4*) and (*P7*)–(*P8*). Based on these results, country dyads that are comprised of both democracies appear to trade more with each other. The coefficients range between [0.066, 0.946] times, or 6.8–146.2%, more.[6]

Our results corroborate those of earlier studies in this vein; specifically, that democratic regimes tend to trade more with each other. The cross-sectional-time-series nature of the panel dataset also allows us to pinpoint the main driver of this result: It is the increase in trade between democracies over time, rather than across space, that is important.

This can be seen from the Hausman test results comparing (*P1*) and (*P2*). Since the (fixed effect) within estimator essentially exploits the time-series variation in the data, our results imply that increases in trade are due to moves toward democratic regime change (over time), as opposed to the trading behavior of democracies versus non-democracies in any given snapshot in time. We believe that the difference in the magnitude of coefficients obtained from the fixed versus random effects models may also be attributed to this phenomenon.[7] This result also corroborates our cross-correlation tabulations (Table 2), while clarifying the otherwise indeterminate visual cues suggested by Fig. 1.

The coefficients of the both democracies dummy for specifications (*P5*) and (*P6*), however, are negative and significant. What might explain the apparent incongruence of our results when we include the interaction terms? To understand the mechanism, it is helpful to rewrite (1) in the following form:

$$\ln\left(T_{ijt}\right) = \alpha + \beta_1 \ln\left(Y_i Y_j\right)_t + \beta_2 \ln\left(\frac{Y_i}{N_i} \cdot \frac{Y_j}{N_j}\right)_t + \beta_3 \ln D_{ij} + \ln \mathbf{Y}'_{ijt}\gamma' + \left[\theta_1 + \theta_2 \times \ln\left(Y_i Y_j\right)_t\right] BOTHDEMOC_{ijt} + \ln \mathbf{X}_{ij}\boldsymbol{\delta} + \varepsilon_{ijt},$$

where we have parsed out the interaction terms from the vector $\mathbf{Y}_{ijt}$. Thus, the total impact of a dual-democratic trading pair on trade flows is the coefficient on $BOTHDEMOC_{ijt}$ alone as well as the coefficient of the interaction term $BOTHDEMOC_{ijt} \times \ln\left(Y_i Y_j\right)_t$. Since the product of GDP is so large, this second term in the parentheses probably outweighs the first for all observations in the data, such that the influence of the both democracies dummy remains positive, as found in the other specifications. When understood in this fashion, the negative coefficients are no longer paradoxical, but rather point to the fact that any influence of democracy on trade is

[6] The upper bound of this range should be interpreted very carefully, as it is due to specification (*P8*), which has a much larger magnitude than the others. Excluding this value brings the range to a more modest 6.8–14.9%, which is within reasonable bounds for alternative empirical models.

[7] An alternative strategy to teasing out this relationship can be found by looking at the estimates for the between model (not reported). While most of the coefficients for the between model are qualitatively similar, the both democracies dummy switches signs (while remaining statistically significant); this suggests that cross-sectional variation not only does not drive the results, it actually works *against* the overall finding that democracies tend to trade more.

heavily moderated by country size. Intuitively, it is trade between the (economically) large, democratic country pairs that are driving our results obtained in Table 3.[8]

Another estimate that deserves explanation is the negative and significant coefficient for the interaction term between the both democracies dummy and GDP per capita in specification (*P8*). We likewise rewrite (1) in the form:

$$\ln\left(T_{ijt}\right) = \alpha + \beta_1 \ln\left(Y_i Y_j\right)_t + \beta_3 \ln D_{ij} + \ln \mathbf{Y}''_{ijt}\boldsymbol{\gamma}'' + \ln \mathbf{X}_{ij}\boldsymbol{\delta} + \left[\beta_2 + \beta_4 \times BOTHDEMOC_{ijt}\right] \ln\left(\frac{Y_i}{N_i} \cdot \frac{Y_j}{N_j}\right)_t + \varepsilon_{ijt}.$$

The partial derivative of trade flows with respect to GDP per capita, which is positive *a priori*, can be decomposed into the coefficient on $\ln\left(Y_i/N_i \cdot Y_j/N_j\right)_t$ alone as well as the coefficient of the interaction term $BOTHDEMOC_{ijt} \times \ln\left(Y_i/N_i \cdot Y_j/N_j\right)_t$. Since $BOTHDEMOC_{ijt}$ is a binary variable, the sum of the coefficients is $0.281 - 0.049 = 0.232$, which is positive. What the negative coefficient on the interaction term implies, however, is that a given increase in GDP per capita in a both-democracy country pair *reduces* trade (relative to nondemocratic country pairs). This suggests that democratic countries that are relatively wealthier—but are not economically large—do not necessarily engage in more trade with other democracies. This makes intuitive sense: Small countries tend to have a narrower production base and be more dependent on trade in general, and so are less likely to allow political–economic pressures associated with democracy to unduly influence trade outcomes.

Finally, the other controls that were included in the specifications were generally consistent with expected signs (although not reported). For example, participation in a regional agreement was positive and significant across all specifications, while policy variables such as tariff barriers and current colonial status demonstrated a negative and significant impact. The other controls were generally insignificant, although they often appear with the expected signs.

Table 4 displays the analogous mixed model estimates using the continuous democracy measure. These are for: (*Q1*) Fixed effects; (*Q2*) Random effects; and fixed and random effects estimates after the inclusion of interaction terms with GDP [(*Q3*) and (*Q4*), respectively] and GDP per capita [(*Q5*) and (*Q6*), respectively].

The results are not unlike the case of the binary democracy measure. Statistically significant (positive) values of the coefficient range [0.017, 0.226], or 1.7–22.6%. Democracies are therefore likely to trade with other democracies: up to almost a quarter times more.

The negative and significant coefficient for specifications (*Q3*) and (*Q4*) may be justified, analogous to the case above, by recognizing that the partial derivative of trade flows with respect to democracy is comprised of the coefficients for $\ln\left(DEM_i \cdot DEM_j\right)_t$ and the interaction term $\ln\left(DEM_i \cdot DEM_j\right)_t \times \ln\left(Y_i Y_j\right)_t$, and that the magnitude of the product of GDP sufficiently large such that the influence of

[8] A similar approach can be used to justify the negative coefficient for the coefficient of the one democracy dummy in specifications (*P3*) and (*P4*).

Table 4 Mixed model regressions for bilateral trade flows and continuous democracy variable

	(*Q1*)	(*Q2*)	(*Q3*)	(*Q4*)	(*Q5*)	(*Q6*)
Log real GDP	0.316	0.695	0.310	0.689	0.315	0.695
	(0.03)***	(0.02)***	(0.06)***	(0.02)***	(0.06)***	(0.02)***
Log real GDP	0.272	0.201	0.233	0.197	0.275	0.223
per capita	(0.05)***	(0.02)***	(0.07)***	(0.03)***	(0.07)***	(0.03)***
Log distance		−1.258		−1.255		−1.277
		(0.04)***		(0.04)***		(0.04)***
Log democracy	0.017	0.005	−0.683	−0.244	0.033	0.227
	(0.00)***	(0.00)	(0.14)***	(0.12)***	(0.08)	(0.07)***
Log democracy			0.014	0.005		
× GDP			(0.00)***	(0.00)**		
Log democracy					−0.001	−0.014
× GDP per capita					(0.00)	(0.00)***
R^2	0.048		0.050		0.048	
χ^2		15,134		8.08E+06		8.07E+06
N	54,654	54,654	54,654	54,654	54,654	54,654

Huber-White (robust) cluster-adjusted standard errors reported in parentheses
* Significance at 10% level
** Significance at the 5% level
*** Significance at the 1% level. Only selected controls are reported, although all variables discussed in the data appendix were included

the democracy variable remains positive. As before, democracy's influence on trade is moderated by economic size.[9]

We note that not all estimates of the coefficient of the democracy variable are statistically significant. In particular, the random effects models in specifications (*Q2*) and (*Q5*) do not produce significant coefficients (actual *p*-values are 0.127 and 0.468, respectively). However, as before, Hausman tests of the two models rejects the random effects model ($\chi^2 = 2008.7$, $p = 0.000$ and $\chi^2 = 1907.4$, $p = 0.000$, respectively). This suggests again that the time-series variation in democratic development—as embodied by the fixed effects model—is responsible for the patterns that we observe in our results; the differences in the magnitude of coefficients for fixed versus random effects can also be understood in this light.

It is important to emphasize that the mixed model estimates are actually potentially more reliable than other, more naïve, empirical approaches. Table 5 presents regressions for the pooled dataset under several alternative specifications. These are: (*B1*) The regression in (1) with binary indicators for trade pairs in which both countries are democracies and for trade pairs in which only one is a democracy, as summarized by the upper specification in (2); (*B2*) The same regression as (*B3*), but with quadratic terms for both log GDP and log GDP per capita; (*B3*) The regression in (1) with the

[9] The explanation forwarded before for the negative coefficient on the democracy-GDP per capita interaction term also applies for the result in specification (*Q6*).

Table 5 Pooled regressions for bilateral trade flows

	(*R1*)	(*R2*)	(*R3*)	(*R4*)
Log real GDP	0.949	0.717	0.951	0.764
	(0.01)***	(0.26)***	(0.01)***	(0.26)***
Log real GDP	0.495	−0.468	0.476	−0.428
per capita	(0.02)***	(0.28)*	(0.02)***	(0.27)
Log distance	−1.112	−1.081	−1.107	−1.080
	(0.03)***	(0.03)***	(0.03)***	(0.03)***
Both democracies	−0.183	−0.189		
	(0.04)***	(0.04)***		
One democracy	−0.129	−0.080		
	(0.06)**	(0.07)		
Log democracy			−0.018	−0.014
			(0.01)**	(0.01)
R^2	0.708	0.708	0.708	0.707
N	54,654	54,654	54,654	54,654

Standard errors robust to country-pair clustering reported in parentheses
* Significance at 10% level
** Significance at the 5% level
*** Significance at the 1% level. Only selected controls are reported, although all variables discussed in the data appendix were included

continuous measure of democracy, as given in the lower specification of (2); (*B4*) The same regression as (*B3*), but with quadratic terms for both log GDP and log GDP per capita.

We first consider the regressions with the binary indicator variables for democracy (specifications (*B1*) and (*B2*)). Interestingly, the OLS results suggest that, in either case when both countries are democracies or where only one is a democracy, there is *less* trade between these two countries. These coefficients are significant for both specifications, and for specification (*B1*), the coefficient for the one democracy dummy is significant at the 5% level. This result is in stark contrast to the results of previous studies, all of which find a positive relationship between democracy and trade, using much of the same controls.

Moving on to the regressions with the continuous measure of democracy (specifications (*B3*) and (*B4*)), the results are in line with the basic results of the first two specifications. That is, the greater the level of democracies in nations that form a trading pair, the *less* these countries trade with each other; indeed, the results indicate that these nations trade between $e^{-0.093} \approx 0.91$ and $e^{-0.082} \approx 0.92$ times, or about 8–9%, less. Note, however, that the coefficient for specification (*B4*) is insignificant at the 10% level.

This could be due to two possible reasons. First, the larger dataset, which includes not just bilateral trade between developed (often democratic) countries and developing (often non-democratic) countries, is able to provide a contrasting result that is not captured when employing a dataset that does not fully capture variable changes

across space as well as time. Second, and related to the first, the differences could arise due to trade-pair heterogeneity that is not well captured by simple OLS. In order to conclusively pin down the relationship between democracy and trade, panel regression techniques are likely to provide better estimates that are able to distill out this heterogeneity. Table 5 therefore underscores the importance of controlling for heterogeneity in trading pairs, and for not drawing premature conclusions from studies that do not control for country pair-specific idiosyncrasies.

4 Extensions and robustness

This section expands on the basic model by considering a series of robustness checks and extensions to our basic empirical model.

First, we take a sub-sample of data selected from the time period of 1965–1995. Specifically, we take observations from 5-year periods, beginning with 1965, to capture changes in levels of democracy. Since levels of democracy typically do not change significantly in a given country in short periods of time, this approach drops potentially repetitive observations. Second, taking as given the Huntington (1991) hypothesis of the "third wave" of democratization in the late twentieth century, we partition the dataset into pre-1990 and post-1990 observations, when the wave petered out.

Third, keeping in mind the results from specifications (*P5*) and (*P6*) that stress the importance of economic size in moderating the amount of trade between democracies, we consider a subset of the data in which bilateral trade occurs within two subgroups: developed countries and developing countries.[10] These subgroups allow us to uncover whether it is the observations from developed countries that drive the results of the basic model. Fourth, we consider an alternative measure of trade barriers—trade openness—as a control, in order to ensure that democracy is not simply acting as a proxy for trade policy.[11]

Fifth, we introduce a stricter definition of democracy for the binary variable, such that only democracies that are relatively mature qualify for such a classification.[12] This more specific variable helps distinguish between the impact of mature democracies versus democracies in general, and helps determine if the mature democracies subgroup is biasing the results of the basic model. Sixth, we indirectly address the endogeneity problem by testing for the possibility of misspecification. To this effect, we run additional panel regressions that control for potential omitted variables that may be correlated with indicators of democracy.[13]

[10] The classification of developed countries follows the definition used by the IMF for industrialized countries.

[11] For example, the democracy variable may be capturing the responsiveness of the political system to special interest lobbying for trade restrictions, rather than the political–economic impact of the presence of democracy per se.

[12] For example, in the earlier binary democracy classification, any country with competitive elections for both the executive branch and the legislature qualifies as a democracy, while this stricter definition requires that the chief executive(s) must face some moderate to substantial constraints imposed by accountability groups or institutions.

[13] A full discussion of policy and stability controls is relegated to the appendix.

Table 6 Robustness checks for bilateral trade flows and democracy

	Binary democracy		Continuous democracy	
	Fixed effects	Random effects	Fixed effects	Random effects
Full sample	0.139***	0.068***	0.017***	0.005
	(0.02)	(0.02)	(0.00)	(0.00)
Selected years	0.086	−0.092	0.015	−0.033
	(0.05)*	(0.05)**	(0.01)	(0.01)***
Pre-1990	−0.030	−0.066	0.003	−0.000
	(0.03)	(0.04)*	(0.01)	(0.01)
Post-1990	0.038	0.212	−0.087	0.070
	(0.04)	(0.05)***	(0.02)***	(0.01)***
Developed only	0.443	0.433	0.284	0.278
	(0.10)***	(0.11)***	(0.05)***	(0.06)***
Developing only	0.189	0.089	0.010	−0.010
	(0.06)***	(0.05)*	(0.01)	(0.01)
Alternative	0.085	0.040	0.026	0.020
openness	(0.02)***	(0.02)*	(0.00)***	(0.00)***
Strict	0.116	0.084		
democracy	(0.03)***	(0.03)***		
Policy and	0.808	0.710	0.035	0.008
stability controls	(0.22)***	(0.26)**	(0.07)	(0.06)

Huber-White (robust) cluster-adjusted standard errors reported in parentheses
* Significance at 10% level
** Significance at the 5% level
*** Significance at the 1% level. Only selected controls are reported, although all variables discussed in the data appendix were included

Seventh, we attempt to directly address the endogeneity problem in two ways: By performing some simple Granger causality tests on a selection of the data, in order to tease out Granger causality; and by running a regression with democracy as a LHS variable, we seek to establish if trade flows are a significant determinant of democracy. Last, we decompose the democracy variable into 21 separate dummy variables in order to distill the extent to which the process of democratic development influences bilateral trade.

Table 6 reports the various perturbations made to the basic model. Both fixed and random effects estimates are reported, but for brevity, only the coefficients for the joint democracy dummy and the log of the continuous democracy variable are shown.

When interpreted as a group, these robustness checks suggest that measures of democracy are sensitive to the changes in specifications previously outlined. While most of the coefficients remain significant, and often at the 1% level, some of the coefficients for democracy actually switch signs. In particular, the sensitivity of democracy to alternative time periods underscores the finding in Sect. 3 that the time element is important. As such, these results provide insight not just into the linkages between democracy and trade flows per se, but also how democratic development factors into

the trade picture. Nonetheless, the overall tenor of these results is that, at least in recent history, nations with developed democratic political institutions are likely to be more engaged in trade with one another than are countries without such institutions. The robustness checks thus suggest that the answer to the main inquiry of this study—whether democracies trade more—is largely affirmative.

The first robustness check yields coefficients with mixed signs. In particular, the fixed effects models maintain a positive coefficient, while the random effects models yield negative and statistically significant coefficients. What might explain this result? Recall, a key factor driving our results in Sect. 3 is the time-series nature of the data. Taking selected 5-year cuts of the data smooths out much of the dynamics of democratic evolution that is essential in understanding how pairwise democracies tend to trade. Since the random effects model is essentially a matrix-weighted average of the within and between estimates, this subset censors the data in a way that allows the cross-sectional features—which tend to show that democratic pairs tend to trade *less*, not more—to dominate the time-series aspects. These aspects, nonetheless, remain present in the data: notice the positive signs when we employ fixed effects.

Another way of looking at the time series effects is to consider the sample before and after the third wave of democratization (Huntington 1991) ended, which is what we seek to perform with our second robustness check. The coefficients for most of the pre-1990 specifications—including the one that is statistically significant—is negative, while coefficients for post-1990 estimates tend to be positive. As such, the partitioning into a pre- and post-democratization time frame suggests a movement over time toward both a significant as well as positive influence of democracy on trade. The anomalous result for the coefficient on the fixed effects estimate post-1990 may be due to the increasing participation of China (a strong nondemocracy) in world trade; this can also be seen from the density of points on the leftmost part of Fig. 2b.

In spite of China's significant presence in world trade, it is trade between large, democratic countries that accounts for finding that democracies tend do trade more. The third robustness test yields positive and highly significant coefficients for the subsample of developed countries. In addition, the estimated coefficients are economically significant: Trade between a pair of developed democracies is on average about 43.2% more. However, the finding that democratic pairs tend to trade more is not limited to developed economies; even among less developed countries, democratic pairs trade an average of 14.9% more (restricting ourselves to statistically significant results).

In some ways, these results are unsurprising. In light of the well-known theoretical argument that trade between democratic partners is based on ties of interest, community and security (Bliss and Russett 1998), democratic nations are far more likely to see confluence in their trade patterns based on these mutual commonalities. Conversely, such ties of commonality are less likely to be pervasive among developing nations, since trade in these nations is often driven by purely economic considerations. This explanation justifies the smaller and less significant coefficients for democracy in the purely developing country subset. This check also underscores another aspect that we have discussed before—that the ability of economically large, developed countries to

be selective with respect to their trading partners is considerably more greater than the corresponding trade decisions of developing countries.

The results from the fourth robustness test demonstrate that it is unlikely that democracy is acting as a proxy for trade policy in general. The coefficient for trade openness is positive and significant at the 1% level (not reported), while both measures of democracy are positive and significant. Although not reported, the one democracy dummy is also positive and significant at the 1% level. This implies that democracy exerts a first-order effect on trade, one that, while possibly influencing trade via the commercial policy channel, also captures some political–economic dynamic that is inherent in the nature of democratic policymaking. This could well be in the form of foreign policy; after all, the employment of trade sanctions is a relatively common strategy for meeting foreign policy objectives determined by the state apparatus.

The fifth check, which uses a stricter definition of democracy, suggests that our somewhat arbitrary definition of what constitutes a democratic country is not critical. This test suggests that it is not only the large, democratic countries that drive our results; these large countries also have a strong democratic tradition, as captured by a stricter definition of democracy. Hence, while the third wave may have created a large number of newly democratic states that are engaged in more trade over time, the ones that have been democratic for the longest time (or the ones that embrace democracy most strongly) are the ones that are also engaged in the most trade.

Similarly, it appears that even after controlling for the political–economic environment via the inclusion of controls for policy quality and political stability (robustness test six), trade flows are still higher for democracies (although this result is not statistically robust for the continuous democracy measure). Two points should be noted, however. First, these controls are proxied by imperfect measures—policy quality by a corruption index and political stability by a government crisis dummy—and so the weaker significance of some coefficients do not necessarily negate the earlier results. Second, it is difficult to establish ex ante how policy quality and political stability might be influenced by democratic outcomes. After all, notoriously non-democratic nations such as Indonesia, Peru, Singapore, and the United Arab Emirates have enjoyed long periods of stability and growth, while others such as Argentina, Iraq, Myanmar, and Zimbabwe have not had such fortune. Likewise, the policy choices of the ruling elite in non-democratic countries are often idiosyncratic, so that a singular directionality may be difficult to isolate. In spite of these shortcomings, the controls included in this check seem to reinforce the linkages between democracy and trade flows.

Overall, while it is possible to construe additional controls to include in the model, the resulting signs of the coefficients and levels of significance of the data suggest that the linkage between trade and democracy is sound, even when basic perturbations to the econometric specification is made.

The seventh check for robustness concerns direct tests for the endogeneity of the democracy variable. First, we consider Granger causality tests on data for bilateral trade between two democracies (the US and the UK), one democracy and non-democracy (the US and Singapore) and two non-democracies (China and Singapore).

The estimation was of the form

$$\begin{bmatrix} DEM_t \\ T_t \end{bmatrix} = \begin{bmatrix} \eta_0 \\ \phi_0 \end{bmatrix} + \begin{bmatrix} \eta_{11} & \eta_{11} \\ \phi_{11} & \phi_{12} \end{bmatrix} \begin{bmatrix} DEM_{t-1} \\ T_{t-1} \end{bmatrix} + \begin{bmatrix} \eta_{21} & \eta_{21} \\ \phi_{21} & \phi_{22} \end{bmatrix} \begin{bmatrix} DEM_{t-2} \\ T_{t-2} \end{bmatrix} + \begin{bmatrix} \mathbf{Z}_{1t} \\ \mathbf{Z}_{2t} \end{bmatrix} + \begin{bmatrix} \upsilon_{1t} \\ \upsilon_{2t} \end{bmatrix}, \tag{3}$$

where $\mathbf{Z}_i t$ is a vector of exogenous variables populated by controls for openness, output, wealth, and distance, and υ_{it} are i.i.d. error terms.

The first subsample was for the years 1948 to 1999, and the second was from 1959 to 1999 (with a gap), and the third was from 1981 to 1997. The results did not reveal Granger causality in either direction, and experimenting with different lag times did not change the findings.[14] Although somewhat discouraging, this test stresses the importance of exploiting the rich dataset to reveal patterns in the cross-sectional data that are otherwise obscured by purely time-series analysis.

Second, we consider a fixed effects model of the form[15]

$$\ln(DEM_i \cdot DEM_j)_t = \rho_1 \ln(DEM_i \cdot DEM_j)_{t-1} + \rho_2 \ln(DEM_i \cdot DEM_j)_{t-2} + \rho_3 \ln T_{ijt} + \mathbf{I}\omega_{ij} + \mathbf{W}_{it}\boldsymbol{\Omega} + \xi_{ij}, \tag{4}$$

where $\boldsymbol{\omega}_{ij}$ captures the (pairwise) individual fixed effects, ξ_{ij} is the i.i.d. error term, and $\mathbf{W}_{it}$ is a vector of control variables that include the controls employed in GDP, GDP per capita, education, urbanization, and population size.[16] The regression was estimated for 5-year periods, with a total of 16,903 pairwise observations.

The Hausman test rejects the random effects model ($\chi^2 = 206.2$, $p = 0.00$), and so we limit our discussion to the fixed effects model. Estimated coefficients (not reported) were all significant at 10% level and consistent with the signs in Barro (1999), with the exception of population (which had a negative coefficient and was significant at 10%), the primary education gap (insignificant), and trade (insignificant). The coefficient for bilateral trade is −0.0064, with a standard error of 0.060. Hence, we obtain some weak evidence in support of trade not being a determinant of democracy. Although this approach is imperfect, this regression represents a second attempt to address the endogeneity problem, and suggests that causality flows from democracy to trade, not

[14] These negative results may have been mitigated somewhat with the application of Granger causality tests for panel data. However, the technique is still in its infancy, and hence estimation of this nature is left for future research. See Hurlin and Venet (2003) for a discussion of theoretical work in this vein.

[15] The main drawback of our approach here is that (4) is somewhat atheoretical. While there exists a literature on the economic determinants of democracy (Barro 1999; Acemoglu et al. 2006), empirical models are generally based on estimating an equation of the form

$$DEM_{it} = \rho_1 DEM_{it-1} + \rho_2 DEM_{it-2} + \rho_3 DEM_{it-1} + \mathbf{W}_{it}\boldsymbol{\Omega} + \xi_{it},$$

for which the unit of analysis is the country-year observation, rather than country-pair-year. We have chosen to proceed in this fashion to retain consistency with the flavor of our approach in (1), while keeping in mind that, unlike the gravity model, there is no strong theoretical basis for an empirical model based on combined pairwise levels of democracy.

[16] Controls are described in greater detail in the appendix.

Table 7 Influence of democratic development on bilateral trade flows

	(*D1*)	(*D2*)
Log real GDP	−0.009	0.322
	(0.03)	(0.02)***
Log real GDP	0.724	0.421
per capita	(0.05)***	(0.03)***
Log distance		−1.303
		(0.04)***
DD00	−0.323	−0.423
	(0.06)***	(0.06)***
DD05	−0.473	−0.541
	(0.09)***	(0.09)***
DD10	0.021	−0.083
	(0.05)	(0.05)*
DD15	0.062	−0.086
	(0.06)	(0.06)
DD19	0.073	−40.080
	(0.05)	(0.05)
R^2	0.176	
χ^2		11,445
N	139,643	139,643

Huber-White (robust) cluster-adjusted standard errors reported in parentheses
* Significance at 10% level
** Significance at the 5% level
*** Significance at the 1% level.
Only selected variables and dummies are reported

the other way round. Nonetheless, the weak power of both tests emphasizes the need for all empirical results of this nature to be founded on a sound theoretical basis.

How important is democratic development in influencing bilateral trade? This is the question that the eighth robustness check seeks to answer. Table 7 provides estimates for both the: (*D1*) Fixed effects and (*D2*) Random effects estimation for the case where democracy is decomposed into 21 separate dummy variables (DD00–DD20), with one corresponding to each cumulative democratic level in the trade pair. This strategy allows the comparison of how different levels of democratic development affect bilateral trade, and provides some clues as to whether there is a "threshold" level of democracy in a trading pair for which trade flows experience a significant boost. In the interests of conserving space, only selected dummies are reported.[17] To avoid perfect multicollinearity, the final dummy DD20 was dropped from the regression.

In general, the lower cumulative democracy dummies possess a negative coefficient—indicating that low levels of democratic development have a negative effect on trade in these trading pairs. For (*D2*), the first cumulative democracy dummy for which the coefficient is indistinguishable from zero is DD17; for (*D1*), the coefficient actually turns positive for DD15, and is followed by three more positive, coefficients (for DD17–DD19; with DD16 being negative but insignificantly different

[17] In the random effects specification, all dummies, except DD15, DD17, and DD19 were significant at the 5% level. For the fixed effects specification, the dummies DD2, DD8, DD10–DD16, and DD19–DD19 were not significant at the 10% level.

from zero). Since both countries must be at least moderately democratic in order to attain a cumulative democracy score of 15 (recall $DEM \in [0, 10]$), this test suggests that the level of democratic development tends to boost trade only for bilateral trading relations between states that display a fairly strong democratic tradition.

5 Conclusion

In closing, we return to the central question that motivated this paper: do democracies trade more? The answer, at least within the context of this present study, is a qualified yes. Trade fosters the fertilization of ideas, and democracy is surely one of them. This finding has been demonstrated using the gravity specification for a very large panel dataset together with panel regression techniques. To that end, this study has upheld the findings of earlier studies that demonstrate that democracies are more likely to trade with each other. It has, however, also shown that this result depends on several key assumptions. The key democracy variable seems to be sensitive to alternative renderings of time periods and cross sections—in the sense that the time series aspect of the data appears to drive the result—and democracy is also moderated by, *inter alia*, economic size. As such, a one-size-fits-all theory of democratic processes and their political economic influences on trade flows and trade patterns is unlikely to be fruitful. Instead, future theoretical research should distinguish between the motivations of trading nations based not just on their broad political-institutional structures, but also on their level of economic development as well as global economic trends.

Future theoretical research would naturally fall along the lines of attempting to build a more coherent model of how democracy affects trade outcomes. Existing research, as reviewed earlier, seldom provide an explicit basis for democracies affecting trade outcomes. Given the generally strong empirical evidence that suggests that the effects of democracy might be first order instead of second order, theoretical models of trade should consider explicitly accounting for this characteristic, instead of treating such outcomes as exogenous, as Grossman and Helpman (1994) do. Clearly, any model to this effect should also allow for heterogeneity between developed and developing countries, and, if possible, take into account the role of constraints and influences imposed by the external environment. In this regard, Mansfield et al. (2000) is an important step forward in this direction. (O'Rourke and Taylor 2006) also develop a model premised on a two-country Heckscher-Ohlin world.

Future empirical research would proceed in attempting to further weed out the endogeneity problem by implementing alternative methodologies to control for causality and/or tackle the causality problem head on. This could involve implementing a more complete Granger causality method than that attempted here, one that is amenable to panel data (as discussed by, for example, Hurlin and Venet (2003). Alternatively, one could employ instrumental variable techniques. This would involve introducing democracy as a left hand side variable, employing Logit/Probit to obtain predicted estimates of binary democracy (such as those introduced in Sect. 4), and using these predicted values as instruments for democracy. The drawback of this strategy—and the main reason why we have not chosen to pursue it for this paper—is that this is likely to significantly reduce the sample size. Eichengreen and Leblang (2006) have

recently taken a stab at establishing identification through instruments, but this has been limited to trade openness, as opposed to volume. The paucity of both aspects of research—theoretical as well as empirical—suggests that much remains to be done.

Appendix

This appendix discusses in some detail the various controls employed for both the benchmark regressions as well as the regressions used in the robustness testing section of the paper. It also discusses in greater detail the data sources.

The vectors for controls are as follows:

$$\mathbf{X}_{ij} = \begin{bmatrix} Border \\ Lang \\ Landl \\ Island \\ Mass \\ ColOcc \\ ColHist \\ Nation \end{bmatrix}, \qquad \mathbf{Y}_{ijt} = \begin{bmatrix} FTA \\ CU \\ CurCol \\ Open \end{bmatrix}, \tag{A.1}$$

where the time invariant terms are: $Border$ is a binary variable which is unity when the trading pair share a contiguous border, and zero otherwise; $Lang$ is a binary variable which is unity when the trading pair share a common language, and zero otherwise; $Landl \in [0, 2]$ is the number of landlocked countries in a trading pair, $Island \in [0, 2]$ is the number of island nations in a trading pair; $Mass$ is the combined land area of the trading pair; and $ColOcc$, $ColHist$ and $Nation$ are binary variables which take on unity if either nation in the pair were ever colonized, shared the same colonizer, or are part of a common nation during the sample, respectively.

The time-variant terms are: the binary variables FTA, CU and $CurCol$, which take on unity when the trading pair belong to a regional trading agreement, a currency union, or are both colonies at time t, and zero otherwise; and a measure for openness. Throughout most of the paper, this measure was taken to be applied import duties. The robustness section applied instead a measure derived from

$$Openness_t = \frac{Imports_t + Exports_t}{GDP_t},$$

where $Imports_t$ and $Exports_t$ denote aggregate imports and exports at time t, respectively.

The robustness section also incorporated two additional controls, one for policy quality and another for political stability. These were a continuous variable for extent of corruption ranging from [0, 6], used as a proxy for policy quality, and a continuous variable for major governmental crises which ranged from [0, 5], used as a proxy for political stability. The separate dummy variables used in (*D1*) and (*D2*) corresponding to the cumulative democracy value were generated from the sum of the two continuous

democracy measures for the country pair, with a value of unity assigned to DDv if the sum was equal to v, and zero otherwise, for $v \in [0, 20]$.

The vectors for controls for democracy as the dependent variable were:

$$\mathbf{Z}_{ijt} = \begin{bmatrix} GDP \\ GDPPC \\ Educ \\ EducGap \\ Urban \\ Pop \\ Oil \end{bmatrix}, \tag{A.2}$$

where GDP and $GDPPC$ are GDP and GDP per capita, $Educ$ and $EducGap$ are average years of primary schooling and the gap between male and female primary schooling (for persons aged 25 and over), $Urban$ is the urbanization rate, Pop is population, and Oil is an indicator variable which is unity when the trading pair has a country that is an oil exporter, as classified by the IMF.

The full regression results are available as a log file posted on one of the authors' website: http://web.centre.edu/jamus.lim/research/codeipe1.txt.

The trade dataset as well as the dataset for openness measures were provided by Andrew Rose, who has made the data freely available online from his website: http://faculty.haas.berkeley.edu/arose/RecRes.htm. The democracy measures were drawn from the Polity IV project dataset, managed by Monty Marshall and Keith Jaggers, also available online: http://www.cidcm.umd.edu/inscr/polity. The control measures for policy quality and political stability were taken from William Easterly and Ross Levine's World Bank growth regressions data, available at: http://paradocs.pols.columbia.edu:8080/datavine/MainPage.jsp. The education controls were taken from the Barro-Lee dataset on international educational attainment, and population and urbanization data were from the World Bank's Global Development Finance database.

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