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North-South Trade: Is Africa Unusual?

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Abstract

We estimate a gravity model to address the question of whether Africa's bilateral trade with industrial countries is "unusual" compared with other developing country regions. Our main finding is that the unusually low level of African trade is explained by economic size, geographical distance, and population. This result holds after controlling for a country's access to the sea, composition of exports, linguistic ties with industrial countries, and trade policies. If anything, the average African country tends to "overtrade" compared with developing countries in other regions, although the degree to which Africa overtrades has steadily declined over the past two-and-one-half decades.

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Summary

The importance of international trade in economic development has been highlighted by the success of many developing countries that have adopted outward-oriented development strategies. Countries in East Asia and, more recently, in Latin America have led the way in opening up their economies. African policymakers, however, have generally been more skeptical about the value of adopting outward-oriented development strategies. Partly reflecting this, Africa's share in world trade has fallen dramatically. Other factors contributing to its marginalization in world trade include the continent's relatively low stage of development, its lagging performance in terms of output growth, and a variety of geographic, historical, and structural factors. In this paper, we examine empirically some of the determinants of Africa's bilateral trade with industrial countries and look more closely at the question of whether it is or is not unusual.

We estimate a gravity model of bilateral trade between developing countries in the south and industrial countries in the north. The estimates are based on a very large sample, consisting of 48,048 observations on bilateral trade between 84 developing countries and 22 industrial countries from 1970 to 1995. Our main finding is that the unusually low level of African trade is explained by the standard gravity model determinants of bilateral trade—economic size and geographical distance—and population. This result holds after controlling for a country's access to the sea, composition of exports, linguistic ties with industrial countries, and trade policies. Thus, Africa's bilateral trade is not unusually low. If anything, the average African country tends to overtrade compared with developing countries in other regions, although the degree to which Africa overtrades has steadily declined over the past two-and-one-half decades.

I. Introduction

The importance of international trade in the process of economic development and its association with economic growth have received increasing attention. A number of factors explain this renewed emphasis on trade. The most obvious is the success of many developing countries that have adopted outward-oriented development strategies. This success became increasingly visible by the early 1980s in many fast-growing countries of the Pacific Rim. Strong performance in these countries stood in sharp contrast to earlier, unsuccessful experiences of inward-oriented, import-substitution strategies in some of the same countries, and to the relatively poor performance of other developing countries that did not embrace outward-oriented strategies.

Countries in East Asia and, more recently, in Latin America have led the way in the adoption of outward-oriented development strategies. African policymakers have generally been more skeptical about the value of opening up their economies; and what trade liberalization has taken place in Africa generally pales beside the sweeping trade reforms adopted in many Latin American countries, as well as in most of the former centrally planned economies of Eastern Europe and Central Asia, during the past decade or so. Partly reflecting this difference, Africa's share in world trade fell dramatically, from 3.1 percent of global exports in the mid-1950s to less than 1.2 percent in 1990 (Amjadi, Reincke, and Yeats, 1996). The potential cost of inward-oriented policies in Africa may have been very large: Dollar (1992), for example, estimates that the adoption of Asian-type outward-oriented policies, coupled with a stable real exchange rate, could have added 2.1 percentage points to annual African growth over the 1976-85 period.

Other factors contributing to Africa's marginalization in world trade include the continent's relatively low stage of development and its lagging performance in terms of output growth (Figure 1). Indeed, Rodrik (1997) argues that the marginalization of Africa in world trade is entirely due to the slow growth of African economies. Rodrik presents empirical results suggesting that Africa's participation in international trade is "normal," given its level of income, country size, and geography. On the face of it, this result would seem to be at odds with the substantial decline in Africa's share of world trade noted above, and with the fact that since 1970 sub-Saharan African GDP (despite growing more slowly than in other regions) has risen more rapidly than its trade, while over the same period trade has risen much more rapidly than GDP in Asia and Latin America (Collier, 1997). The objectives of this paper are to examine empirically some of the determinants of Africa's bilateral trade with the north, and to look more closely at the question of whether, in light of those determinants, Africa's trade is or is not unusual.[2]

In addition to marked differences in growth performance between relatively open and closed economies, the renewed emphasis on trade has reflected a resurgence of theoretical analyses and empirical studies of economic growth (see, for example, Barro and Sala-i-Martin, (1995)).

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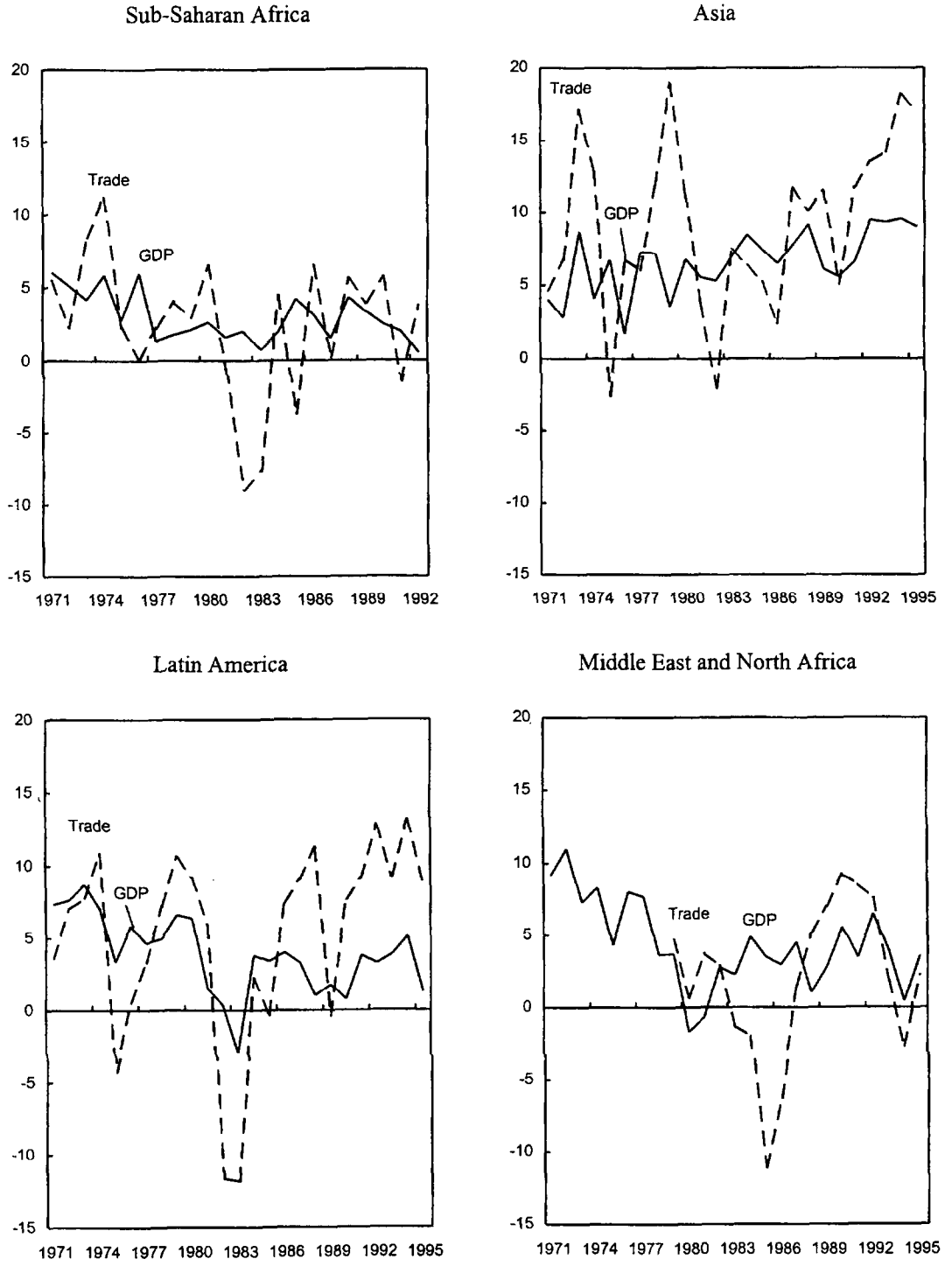
[2]For ease of exposition, we sometimes refer to sub-Saharan Africa as simply Africa.

Figure 1. Trade Volumes and Real GDP of Developing Country Regions
(Annual percent change)



Source: IMF, World Economic Outlook database.

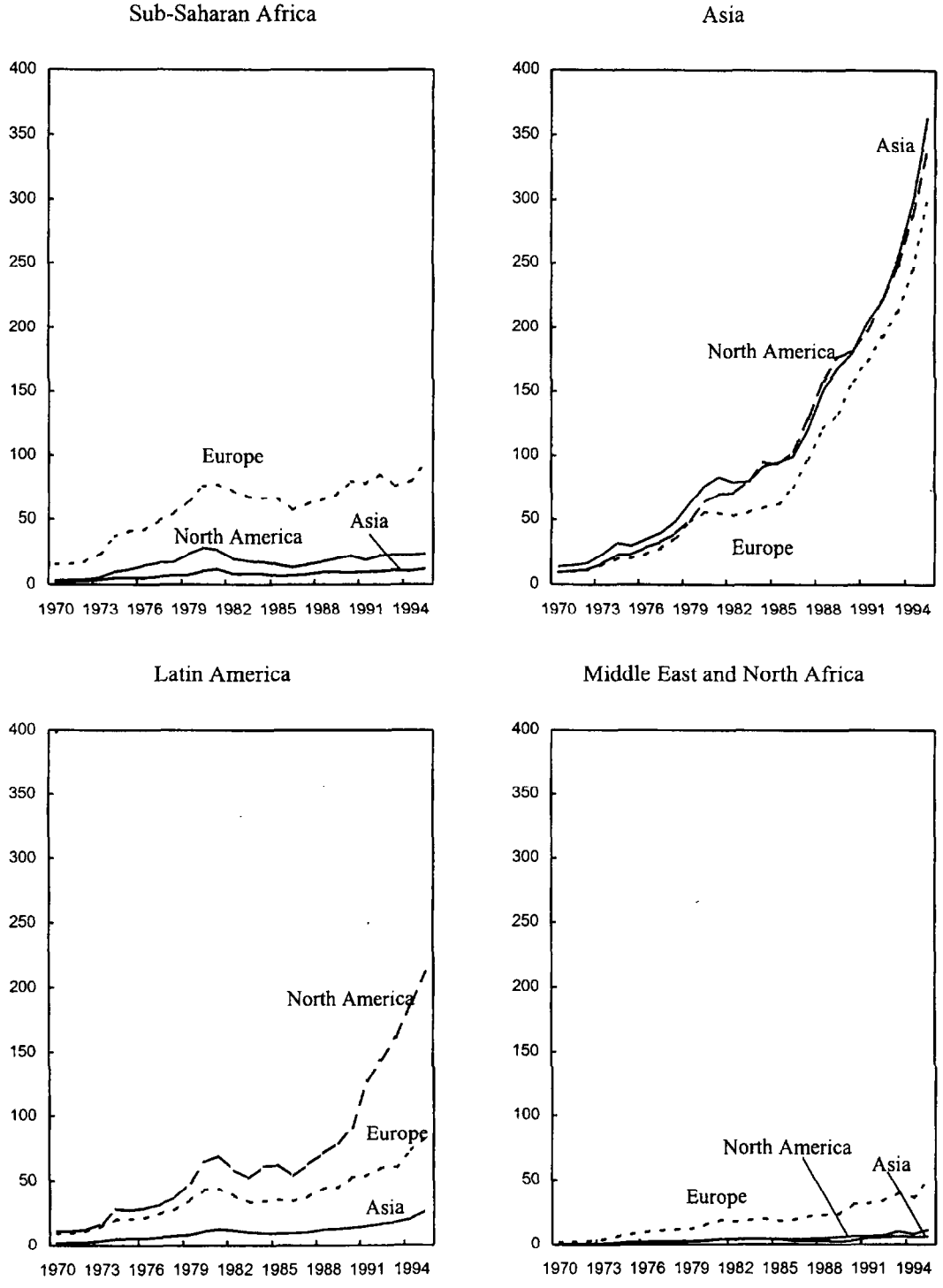
Most empirical studies find a positive relationship between some measure of export orientation or trade openness and income growth. There remains, however, considerable controversy concerning the robustness of this result (Levine and Renelt, 1992; and Sala-i-Martin, 1997). Much of the theoretical literature emphasizes the endogenous nature of innovation and the importance of externalities and technological spillovers, and highlights trade or foreign direct investment as vehicles whereby less-developed countries can catch up to more-advanced countries (Grossman and Helpman, 1991). The few empirical studies that have explicitly focused on these aspects of the growth process find evidence of large international technology spillovers and highlight the role of trade as a vehicle for the spillovers (see, for example, Coe, Helpman, and Hoffmaister, (1997)). Since most developing countries in the south do little if any innovation, it is primarily through trade with developed countries in the north—rather than through trade with other developing countries—that they profit from higher levels of technological development. For this reason, we focus on north-south bilateral trade.

It is clear from the data displayed in Figure 2 that Africa's trade with industrial countries is unusual compared with developing countries in Asia and Latin America: not only is it relatively low, it has also been comparatively stagnant since the early 1980s. Compared with countries in the Middle East and North Africa, however, Africa's trade with industrial countries in Europe is relatively high. These differences, of course, could simply be a reflection of linguistic or cultural ties and of the relatively small size of most African economies and their comparatively poor growth performance during the past 25 years.

To control for these and other factors, we estimate a gravity model of bilateral trade between developing countries in the south and industrial countries in the north. Our sample is very large, consisting of 48,048 observations on bilateral trade between 84 developing countries and 22 industrial countries from 1970 to 1995. Our main finding is that the unusually low level of African trade is explained by the standard gravity model determinants of bilateral trade—economic size and geographical distance—and by population. This result holds after controlling for a country's access to the sea, composition of exports, linguistic ties with industrial countries, and degree of openness. If anything, the average African country tends to **overtrade** —in the sense that its trade is higher than would be explained by the various determinants of bilateral trade—compared with developing countries in other regions, although the degree to which Africa overtrades has steadily declined over the past two-and-one-half decades. Our results thus support those reported by Rodrik (1997).

The next section presents the gravity model, the analytical basis for our empirical work. Section III presents our estimation results. Section IV concludes. Data definitions and sources are discussed in the Appendix.

Figure 2. Bilateral Trade of Developing and Industrial Country Regions
(Billions of U.S. dollars)



Source: IMF, *Direction of Trade Statistics*.

II. The Gravity Model

The gravity model is the most commonly used analytical framework for studying bilateral trade. As is often the case, the elaboration of the theoretical foundations, which were initially viewed as suspect, lagged successful empirical implementation. The important theoretical papers include Anderson (1979), who shows that the gravity model can be derived from expenditure share equations, assuming that commodities are distinguished by place of production; Helpman (1984) and Bergstrand (1985), who demonstrate that the gravity model can be derived from models of trade in differentiated products; and Deardorff (1995), who shows that the gravity model is consistent with the Heckscher-Ohlin model expanded to include transport costs. As Helliwell (1998) notes, the gravity model has gone from being a theoretical orphan to being the favored child of all main theories of international trade.

There have been numerous empirical applications of the gravity model dating from the early 1960s.[3] Many of the more recent studies have addressed the type of question implicit in the title to this paper: Is the level of trade of country or region X "unusual" in the sense of being significantly different from what would be predicted by the standard gravity model determinants of trade? In the 1980s, for example, the emergence of large trade imbalances in the United States and Japan stimulated a number of studies of Japanese imports, which reached differing conclusions about the extent to which they were or were not unusual.[4] Gravity model studies have also examined the effects on trading patterns of the EC and EFTA (Bayoumi and Eichengreen, 1995), economic reform in Eastern Europe (Wang and Winters, 1992), and the formation of regional trading blocs (Frankel, Stein, and Wein, 1995; and Frankel, 1997). More recently, the gravity model has been used to estimate the effects of national borders on trade (Helliwell, 1998, and the references cited therein). As noted, Rodrik (1997) uses a gravity-type model to estimate the extent to which African trade is unusual, and Foroutan and Pritchett (1993) employ a gravity model to examine trade between the countries of sub-Saharan Africa; both studies conclude that African trade is consistent with the standard gravity model determinants of trade.

In its simplest form, the gravity model relates some measure of bilateral trade to the economic mass of the two countries and the distance between them

$$TRADE_{ijt} = (Y_{it}Y_{jt})^{\alpha} D_{ij}^{\beta} e^{\mu_{ijt}}, \qquad (1)$$

where $TRADE_{ij}$ is bilateral trade—either nominal exports, imports, or the sum of the two—from country i to country j, Y_i is nominal GDP in country i, Y_j is nominal GDP in country j, D_{ij} is geographic distance between country i and country j, and t is a time subscript. We expect trade to be positively affected by economic mass ($\alpha > 0$) and negatively related to

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[3]Frankel (1997) and Helliwell (1998) discuss earlier contributions.

[4]See Helliwell (1998, Chapter 3) and Golub (1994) for references to the literature.

distance ($\beta < 0$). We use the subscript i to denote developing countries in the south and the subscript j to denote industrialized countries in the north. μ_{ijt} is

$$\mu_{ijt} = \gamma_I + \varphi_J + \delta_t + \epsilon_{ijt}, \tag{2}$$

where γ_I are fixed effects for developing country region I, φ_J are fixed effects for industrial country region J, δ_t are time effects, and ϵ_{ijt} is a well-behaved error term. The developing country regions are sub-Saharan Africa, Asia, Latin America, and the Middle East and North Africa; the industrial country regions are Asia, Europe, and North America.

This formulation allows straightforward tests of whether, after controlling for economic size and distance, bilateral trade from a region is "normal" or different from other regions: the test is simply whether the estimated γ_I are significantly different across regions. Similarly, tests of the statistical significance of δ_t would indicate changes in bilateral trade over time after controlling for the other variables.

We also consider a number of alternatives to the above specification

$$TRADE_{ijt} = (Y_{it}Y_{jt})^{\delta}(P_{it}P_{jt})^{\theta}D_{ij}^{\beta}e^{\mu_{ijt}}, \tag{1'}$$

where P is population. As before, we would expect trade to be positively related to the GDPs ($\delta > 0$). The product of per capita GDPs ($Y_i Y_j / P_i P_j$), a proxy for the stage of development, would replace the economic mass variable if the constraint $\theta = -\delta$ is imposed. Without this constraint, we would expect trade to be negatively related to the level of population ($\theta < 0$), indicating that poorer countries—countries with larger populations for a given level of GDP—trade less than richer countries.

To test for differences in the trading patterns of the four developing country regions with the three industrial country regions, and to replace the time dummies with a time trend and test for different time trends, we also consider

$$\mu_{ijt} = \gamma_I\varphi_J + \tau T_t + \epsilon_{ijt} \tag{2'}$$

or $$\mu_{ijt} = \gamma_I\varphi_J + \tau_I\gamma_I T_t + \epsilon_{ijt}, \tag{2"}$$

where T is a time trend taking the value of one in period t_0 and increasing by one in each year thereafter, and τ_I is the effect of the time trend in developing country region I.

To test the robustness of our results, we also estimate equations including variables representing geographical and linguistic features of countries, the commodity composition of exports, and a measure of the trade policies in developing countries.

Before discussing our empirical results, we note that there are two important respects in which our empirical analysis differs from many gravity model studies in the literature. The first is that most studies are based on cross-section data for either a given year or for a given time

period. This is partly because the gravity model is typically applied to bilateral trade, with the consequence that the data sets, and in particular panel data sets, are often very large. In our case, for example, we use data on bilateral trade between 84 developing countries and 22 industrial countries, giving 1,848 observations for each year, and 48,048 observations over the full 1970-95 time period.[5] An advantage of such a large data set is that it allows us to test explicitly for changes in trading patterns over time, and to examine how such changes may have differed among regions. Most studies, by contrast, only indirectly address the issue of changes over time by reporting a series of regressions for individual years.

A second way that our analysis differs from most studies is that we use nonlinear estimation techniques on equations specified as above. By contrast, most studies do a logarithmic transformation, which allows them to estimate the log-linear equation with standard estimation techniques; estimating a log-linear specification also requires substantially less computing power than does nonlinear estimation. Normally a logarithmic transformation is not problematic. In the case of bilateral trade data, however, many observations are zero, in which case a logarithmic transformation is not possible. A typical "solution" to this problem is to omit the zero observations.[6] But two countries may not trade because they are small, distant, or both, in which case the gravity model should predict that bilateral trade would be very low or nonexistent. Omitting these observations represents a nonrandom screening of the data that may lead to biased or inconsistent estimates.[7]

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[5]Reading these data requires more than 50 megabytes of free RAM, and running one of our regressions requires 30-45 minutes of CPU time on an Indigo2 Impact 10,000 Silicon Graphics workstation. Running the same regression on a WINTEL PC based on a Pentium 200 MHZ processor would take roughly ten times longer; on a Pentium Pro 233 MHZ, it would take roughly three times longer.

[6]There are a number of ways to deal with the zero observations. Foroutan and Pritchett (1993), for example, estimate a Tobit model that implicitly incorporates information in the zero observations; and Wang and Winters (1992) add an arbitrarily small number to the zero observations before doing a logarithmic transformation. See Frankel (1995, Chapter 6) for a full discussion of alternative methods to deal with zero observations.

[7]The bias introduced is analogous to the truncated or censored dependent variable bias. Green (1981) shows that when the variables are distributed normally, the size of the bias is inversely proportional to the share of the sample included in the regression, i.e., the smaller the share of observations included in the regression the greater the bias. This bias is particularly relevant, given our focus on Africa, because in our sample roughly 13 percent of the observations for sub-Saharan African countries are zero, compared with 5-6 percent in the other developing country regions. For example, if equation (vii) in Table 1 is estimated without the zero observations, the estimated trend decline in African bilateral trade is an order of magnitude smaller, and the estimated African fixed effects for Asia and North America reverse signs, compared with the estimates reported in Table 1 that include the zero observations.

Table 1. Gravity Model Panel Estimation Results
(Dependent variable is bilateral trade of 84 developing countries with 22 industrial countries, 1970-95; 48,048 observations)

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
$Y_i Y_j$	0.658 *		0.883 *	0.876 *	0.986 *	0.973 *	1.004 *
	(0.004)		(0.004)	(0.003)	(0.005)	(0.005)	(0.005)
$Y_i Y_j / P_i P_j$		0.675 *					
		(0.006)					
$P_i P_j$			-0.313 *	-0.295 *	-0.349 *	-0.342 *	-0.368 *
			(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
D_{ij}	-0.123 *	-0.355 *	-0.052 *	-0.067 *	-0.035 *	-0.037 *	-0.044 *
	(0.005)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
γ_{SSA}	-0.314 *	-1.212 *	-0.292 *				
	(0.103)	(0.219)	(0.087)				
γ_{ASIA}	0.610 *	1.878 *	0.767 *				
	(0.096)	(0.116)	(0.080)				
γ_{LA}	0.339 *	1.203 *	0.218 *				
	(0.099)	(0.118)	(0.083)				
γ_{MENA}	-0.582 *	-1.103 *	-0.698 *				
	(0.110)	(0.226)	(0.094)				
φ_{NA}	0.731 *	2.606 *	0.939 *				
	(0.073)	(0.107)	(0.058)				
φ_{ASIA}	0.779 *	2.466 *	0.769 *				
	(0.073)	(0.107)	(0.058)				
φ_{EUR}	-0.223 *	-0.742 *	-0.246 *				
	(0.075)	(0.122)	(0.060)				
$\varphi_{NA}*\gamma_{SSA}$				-0.382 *	-0.334 *	-0.333 *	0.196 *
				(0.070)	(0.086)	(0.072)	(0.099)
$\varphi_{NA}*\gamma_{ASIA}$				0.661 *	0.672 *	0.669 *	0.775 *
				(0.056)	(0.077)	(0.060)	(0.059)
$\varphi_{NA}*\gamma_{LA}$				0.544 *	0.449 *	0.444 *	-0.615 *
				(0.059)	(0.081)	(0.064)	(0.070)
$\varphi_{NA}*\gamma_{MENA}$				-0.841 *	-0.859 *	-0.844 *	-0.926 *
				(0.085)	(0.099)	(0.086)	(0.140)
$\varphi_{ASIA}*\gamma_{SSA}$				-0.050	0.016	0.011	0.640 *
				(0.102)	(0.108)	(0.098)	(0.124)
$\varphi_{ASIA}*\gamma_{ASIA}$				1.456 *	1.415 *	1.416 *	1.496 *
				(0.054)	(0.075)	(0.058)	(0.057)
$\varphi_{ASIA}*\gamma_{LA}$				-0.750 *	-0.831 *	-0.828 *	-2.044 *
				(0.080)	(0.096)	(0.082)	(0.089)
$\varphi_{ASIA}*\gamma_{MENA}$				-0.872	-0.893 *	-0.883 *	-0.982 *
				(0.176)	(0.179)	(0.172)	(0.208)
$\varphi_{EUR}*\gamma_{SSA}$				0.358 *	0.389 *	0.385 *	0.949 *
				(0.066)	(0.080)	(0.067)	(0.097)
$\varphi_{EUR}*\gamma_{ASIA}$				0.014	-0.025	-0.018	0.099
				(0.056)	(0.075)	(0.059)	(0.058)
$\varphi_{EUR}*\gamma_{LA}$				-0.825 *	-0.860 *	-0.860 *	-1.993 *
				(0.067)	(0.083)	(0.069)	(0.076)
$\varphi_{EUR}*\gamma_{MENA}$				0.297 *	0.313 *	0.319 *	0.236
				(0.059)	(0.075)	(0.061)	(0.130)
T						-0.039 *	
						(0.001)	
$T*\gamma_{SSA}$							-0.028 *
							(0.004)
$T*\gamma_{ASIA}$							-0.002
							(0.001)
$T*\gamma_{LA}$							0.053 *
							(0.002)
$T*\gamma_{MENA}$							0.006
							(0.006)
Time effects (δ_t)	no	no	no	no	yes	no	no
R^2 adjusted	0.528	0.346	0.648	0.698	0.708	0.706	0.714
SEE	1.352	1.590	1.167	1.080	1.064	1.066	1.053

Notes: Variables are defined in the text and the Data Appendix. Standard errors are reported in parentheses. * indicates significantly different than zero at the 5 percent confidence level.

III. Empirical Results

Table 1 reports our regression results with the standard gravity model determinants of bilateral trade, based on the nonlinear specifications discussed above. Initial estimates indicated that it made little difference whether we used bilateral exports, imports, or trade (the sum of exports and imports) as the dependent variable, so we report only results using trade. The independent variables are defined above. The regional fixed effects, such as γ_{SSA}, are always reported relative to the mean for all southern or northern countries; this means that the weighted (by the number of countries) average of the fixed effects for the southern or northern countries always sums to zero. The relevant test for whether a region differs from other regions, therefore, is simply a test of whether the reported coefficient is significantly different from zero, as indicated by the asterisks in the table.[8] The regional fixed effects take a value of one whenever there is any trade from or to a country in that region, and zero otherwise. Data sources and the country composition of the regions are defined in the appendix.

Equation (i) reports the basic specification of the gravity model. The estimated coefficients on the economic mass variable $(Y_i Y_j)$ and on distance (D_{ij}) are of the expected sign and precisely estimated, as would be expected given the large number of observations. The regional fixed dummies for the developing countries (the γ_i's) are also all significantly different from zero. The results indicate that, after controlling for economic size and distance, the typical Latin American country's trade with the north is about 90 percent higher than the average African country, while the typical Asian country's trade is about 200 percent higher.[9] Sub-Saharan African countries do, however, trade more with the north than do Middle Eastern and North African countries. The regional fixed dummies for the industrial countries (the φ_j's) are all significant and indicate that, after controlling for the other variables, North America (Canada and the United States) and Asia (Australia, Japan, and New Zealand) trade much more with developing countries than do the industrial countries of Europe.

Equation (ii) replaces the product of the GDPs with the product of the per capita GDPs $(Y_i Y_j / P_i P_j)$. All of the estimated coefficients remain the same sign and highly significant, although their magnitudes change and the goodness of fit declines substantially. Equation (iii) includes the product of the GDPs and populations $(P_i P_j)$ separately. The greatly improved fit

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[8]Wald tests are used to test the null hypothesis of equality with the mean.

[9]The estimate of the percent change in trade when a dummy variable is equal to one is calculated as 100 times the exponential of the estimated coefficient minus one (see Frankel (1997)). The exponential of the difference of two estimated coefficients would be used to calculate the percent change relative to another region; the 200 percent referred to in the text, for example, is calculated as 100•[exp {0.779-(-0.314)}-1].

suggests that the constraint in equation (ii) that the coefficients on GDP and population be equal in size and of opposite sign is rejected by the data. The estimated coefficient on population is negative and highly significant, implying that poor countries trade less than richer countries—perhaps because imports are superior goods or because trade involves a variety of transactions costs that are particularly high in poor countries (Collier, 1997).

To examine more closely the differences in trading patterns not explained by the gravity determinants of bilateral trade, equation (iv) replaces the seven individual regional fixed effects with fixed effects for each of the 12 pairs of north-south regions (i.e., it includes the interaction of each of the four developing country fixed effects with each of the three industrial country fixed effects). Most of these interactive fixed effects are significant. The estimated coefficients suggest that proximity—as distinct from distance—is important: Africa overtrades with Europe and undertrades with North America and Asia; developing countries in Asia overtrade with industrial countries in Asia and North America; Latin American countries overtrade with North America and undertrade with Asia and Europe; and Middle Eastern and North African countries overtrade with Europe and undertrade with North America.

Turning to the question of changes in bilateral trade over time, equation (v) includes time effects, specified as a dummy variable for each year (the δ_t in equation 2). This has little effect on the results, although the estimated coefficient on the economic mass variable $(Y_i Y_j)$ increases somewhat while the coefficient on distance (D_{ij}) falls. All of the (unreported) estimated coefficients on the time dummies are positive and significant, and they decline relatively steadily from $\delta_{1971} = 0.99$ to $\delta_{1995} = 0.06$. In light of this, equation (vi) replaces the individual time dummies with a time trend (T). The estimated coefficient on the time trend is highly significant and indicates that, after controlling for the other variables, north-south bilateral trade declined about 4 percent a year since 1970.

Equation (vii) tests whether there have been significant differences in the degree to which trade in developing country regions has changed over time. It does this by allowing the estimated coefficients on the time trend to differ among regions, that is, by including $T \cdot \gamma_{SSA}$ and comparably defined variables for Asia, Latin America, and the Middle East and North Africa (the estimated coefficients are reported relative to their mean). These results indicate that, relative to the average of developing country regions, there has been a significant negative trend of bilateral trade between the north and Africa, and a significant positive trend of bilateral trade between the north and Latin America. The region-specific time trends reverse the sign of the African fixed effect for North America and make the African fixed effect for Asia significant, both of which now become positive; the time trends reverse the sign for the Latin American fixed effect for North America, which now becomes negative. These results suggest that one of the important ways in which African bilateral trade with industrial countries is unusual is that, other things held constant, it has been declining over the past 25 years, whereas bilateral trade between other developing country regions and industrial countries has been stable or increasing.

To summarize the differences between developing country regions over time, Figure 3 combines the region-specific fixed effects and the region-specific time trends from equation (vii) in Table 1 (first column).[10] The "combined" fixed effects indicate that—after controlling for the gravity determinants of trade, and relative to other developing countries—developing countries in Asia overtrade with industrial countries in North America and Asia, while the developing countries in the Middle East and North Africa undertrade with the same northern regions; for both of these developing country regions, the "combined" fixed effects are essentially stable over time, reflecting the insignificant estimated region-specific trends. African countries, however, initially overtraded with all northern regions, although this trade steadily declined over the subsequent years: after the mid-1970s and the early 1990s, respectively, Africa began undertrading with North America and Asia. Latin America, by contrast, initially undertraded with all northern regions, but the undertrading with Asia and Europe has steadily diminished, and Latin America has overtraded with North America since the early 1980s.

To test the robustness of these results and understand better some of the factors that might be behind bilateral trading patterns, we report in Table 2 regressions with a number of additional variables, some of which are particularly relevant to Africa. The additional variables, which are defined more precisely in the Data Appendix, are the following:

- A dummy variable (LL_i) that takes the value of one if developing country i is landlocked and zero otherwise, as suggested by Sachs and Warner (1997). Out of the 84 developing countries in our sample, 14 are landlocked, of which 11 are in Africa.

- A dummy variable ($PRIM_i$) that takes the value of one if developing country i is a primary commodity exporter, as defined in IMF (1997, Statistical Appendix), and zero otherwise. Of the 36 primary product exporters in our sample, 26 are in Africa.

- Linguistic dummy variables that take the value of one if developing country i and industrial country j both use French, Spanish, or English as their official or main commercial language.[11]

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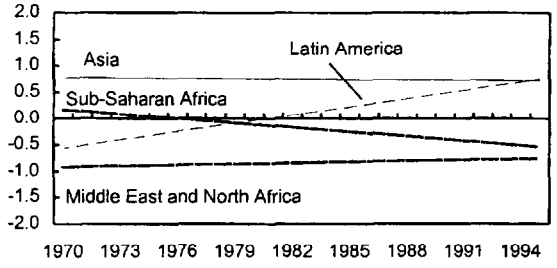
[10]The panels in Figure 3 show the value of the "intercept" (expressed as the deviation from the mean intercept of all developing country regions) for each year for the bilateral trade of an average country in each southern region with an average country in each northern region. The bottom panel shows the combined fixed effects relative to all industrial countries, which are calculated as the weighted average of the intercepts for the northern regions using the number of countries in each northern region (relative to the 22 northern countries) as the weights.

[11]We also tested for the importance of linguistic ties between Portuguese-speaking countries, but the estimated coefficients were not significant.

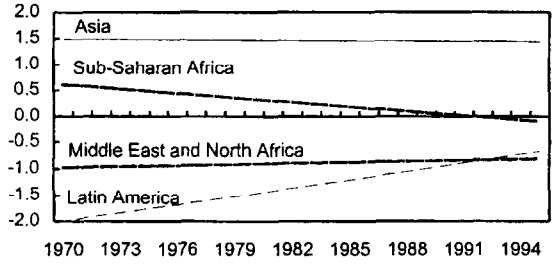
Figure 3. Equation Intercepts for Developing and Industrial Country Regions

GRAVITY MODEL

North America



Asia



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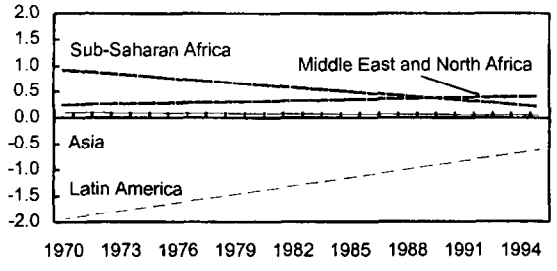
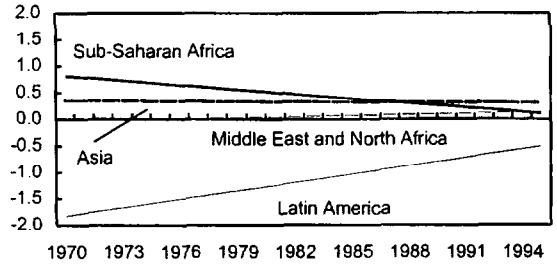
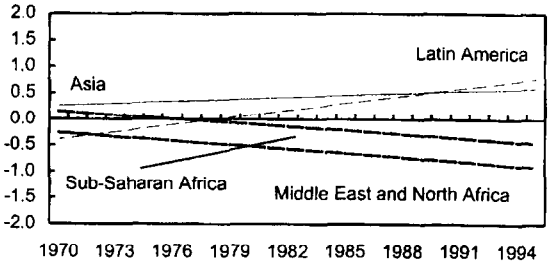


All Industrial Countries

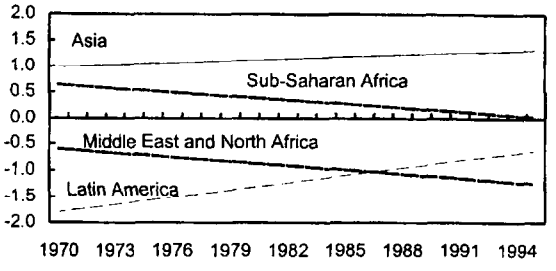


EXPANDED GRAVITY MODEL

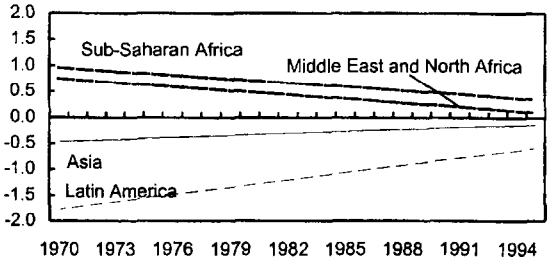
North America



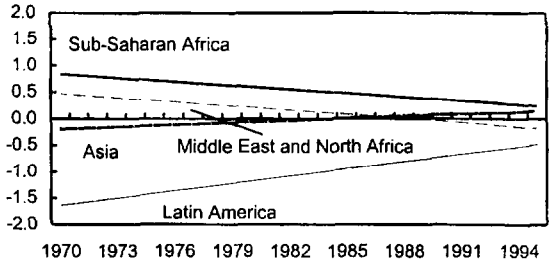
Asia



Europe



All Industrial Countries



Source: Authors' calculations.

Note: Measured in the logarithm of billions of U.S. dollars. The gravity model is based on equation (viii), Table 1; the extended gravity model is based on equation (vi), Table 2. All industrial countries refers to a weighted average of the industrial country regions.

Table 2. Expanded Gravity Model Estimation Results
(Dependent variable is bilateral trade of developing countries with 22 industrial countries)

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Y_i, Y_j	1.001 *	0.985 *	1.013 *	0.991 *	1.149 *	1.056 *
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
P_i, P_j	-0.366 *	-0.361 *	0.365 *	-0.358 *	-0.492 *	-0.324 *
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
D_{ij}	-0.045 *	-0.047 *	-0.050 *	-0.054 *	-0.054 *	-0.021 *
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
φ_{NA}*γ_{SSA}	0.211 *	0.254 *	0.134	0.200	0.232 *	0.173 *
	(0.099)	(0.103)	(0.100)	(0.103)	(0.093)	(0.087)
φ_{NA}*γ_{ASIA}	0.760 *	0.697 *	0.780 *	0.691 *	1.067 *	0.249 *
	(0.059)	(0.060)	(0.060)	(0.061)	(0.060)	(0.064)
φ_{NA}*γ_{LA}	-0.625 *	-0.646 *	-0.532 *	-0.575 *	-1.138 *	-0.433 *
	(0.071)	(0.073)	(0.071)	(0.073)	(0.076)	(0.071)
φ_{NA}*γ_{MENA}	-0.939 *	-0.952 *	-0.855 *	-0.870 *	-0.464 *	-0.238 *
	(0.140)	(0.145)	(0.137)	(0.139)	(0.112)	(0.104)
φ_{ASIA}*γ_{SSA}	0.652 *	0.726 *	0.645 *	0.736 *	0.669 *	0.664 *
	(0.124)	(0.125)	(0.123)	(0.124)	(0.107)	(0.099)
φ_{ASIA}*γ_{ASIA}	1.482 *	1.402 *	1.471 *	1.369 *	1.782 *	0.980 *
	(0.057)	(0.058)	(0.057)	(0.058)	(0.057)	(0.060)
φ_{ASIA}*γ_{LA}	-2.053 *	-2.102 *	-2.033 *	-2.099 *	-2.425 *	-1.834 *
	(0.089)	(0.092)	(0.089)	(0.092)	(0.089)	(0.083)
φ_{ASIA}*γ_{MENA}	-0.993 *	-1.043 *	-0.988 *	-1.028 *	-0.801 *	-0.580 *
	(0.208)	(0.214)	(0.205)	(0.209)	(0.199)	(0.187)
φ_{EUR}*γ_{SSA}	0.963 *	1.022 *	0.948 *	1.021 *	0.976 *	0.980 *
	(0.097)	(0.101)	(0.096)	(0.099)	(0.088)	(0.081)
φ_{EUR}*γ_{ASIA}	0.085	0.013	0.115	0.023	0.383 *	-0.473 *
	(0.058)	(0.059)	(0.058)	(0.059)	(0.059)	(0.062)
φ_{EUR}*γ_{LA}	-2.002 *	-2.044 *	-1.978 *	-2.034 *	-2.422 *	-1.807 *
	(0.076)	(0.078)	(0.077)	(0.079)	(0.079)	(0.075)
φ_{EUR}*γ_{MENA}	0.224	0.200	0.175	0.164	0.539 *	0.773 *
	(0.130)	(0.135)	(0.127)	(0.128)	(0.103)	(0.093)
T*γ_{SSA}	-0.029 *	-0.031 *	-0.029 *	-0.032 *	-0.031 *	-0.024 *
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
T*γ_{ASIA}	-0.002	0.001	-0.001	0.002	-0.019 *	0.013 *
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
T*γ_{LA}	0.053 *	0.054 *	0.052 *	0.054 *	0.082 *	0.046 *
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
T*γ_{MENA}	0.007	0.009	0.007	0.008	-0.014 *	-0.026 *
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)
LL_i	-1.171 *			-1.106 *	-0.938 *	-0.980 *
	(0.335)			(0.330)	(0.250)	(0.225)
$PRIM_i$		-0.232 *		-0.229 *	0.148 *	0.207 *
		(0.022)		(0.022)	(0.017)	(0.016)
$FRENCH_{ij}$			0.962 *	1.079 *	0.952 *	1.132 *
			(0.057)	(0.057)	(0.046)	(0.043)
$SPANISH_{ij}$			0.492 *	0.466 *	0.591 *	0.630 *
			(0.150)	(0.151)	(0.134)	(0.117)
$ENGLISH_{ij}$			0.171 *	0.161 *	0.023 *	0.221 *
			(0.010)	(0.010)	(0.010)	(0.010)
$TRADEPOL_i$						0.776 *
						(0.012)
R^2 adjusted	0.714	0.715	0.716	0.717	0.779	0.806
SEE	1.052	1.051	1.048	1.046	0.721	0.674
Observations	48,048	48,048	48,048	48,048	36,410	36,410

Notes: Variables are defined in the text and the Data Appendix. Standard errors are reported in parentheses. * indicates significantly different than zero at the 5 percent confidence level. Equations (i)-(iv) are based on data for 84 developing countries over 1970-95 period; equations (v) and (vi) use data for 81 developing countries over 1970-92 period.

All of these variables are highly significant when added to the specification of equation (vii) in Table 1. The first three equations in Table 2 indicate that developing countries that are landlocked and that mainly export primary products tend to have lower levels of bilateral trade with industrial countries—although there is no a priori reason why primary product producers should have lower rather than higher trade—and that countries tend to trade more with countries that speak the same language. Equation (iv) in Table 2 includes all of the above variables; the estimated coefficients on the gravity determinants and the estimated fixed effects are essentially unchanged from equation (vii) in Table 1.

We also include the Sachs-Warner measure of trade policy ($TRADEPOL_i$) (Sachs and Warner, 1995). On this measure, country i's policies are deemed to be open to trade, in which case the variable is equal to one, if it satisfies four tests: (i) average tariff rates of below 40 percent; (ii) average quota and licensing coverage of imports of less than 40 percent; (iii) a black market exchange rate premium of less than 20 percent; and (iv) no extreme controls such as taxes, quotas, or state monopolies on exports. As can be seen from Figure 4, the average value of this measure of trade policy for sub-Saharan Africa is much smaller than the average for the other developing country regions. Moreover, the trade liberalization that has occurred in sub-Saharan Africa since the mid-1980s has been relatively modest compared with that in Latin America or, to a lesser extent, the Middle East and North Africa. The trade policy measure is not available for the full time period or for all of the countries in our sample;[12] to isolate the impact of the smaller sample, therefore, equation (v) in Table 2 is specified the same as (iv). Estimating over the smaller sample results in significant increases in the estimated fixed effects for Europe-Asia and Europe-Middle East and North Africa, and a significant positive estimated trend for the Middle East and North Africa. In addition, the estimated effect of being a primary commodity producer switches from negative to positive.[13] Equation (vi) includes the trade policy measure, which is correctly signed and very significant. The main changes to the estimated coefficients are that the Europe-Asia fixed effect becomes negative and the estimated trend for Asia becomes positive.

The second column of Figure 3 summarizes the results of equation (vi) in Table 2 by combining the region-specific fixed and trend effects. With the smaller sample period and the inclusion of the trade policy measure, the Middle East and North Africa region has essentially the same time pattern as Africa: both regions have experienced a decline in bilateral trade with the north over the past 25 years. Developing countries in Latin America and, to a lesser extent, in Asia, on the other hand, have increased bilateral trade with the north, over the past 25 years. In terms of the level of bilateral trade, Africa initially overtraded with the north, compared with other developing country regions, but, by the early 1990s, Africa was not unusually different from other developing country regions—a finding that is consistent with Rodrik's (1997) results.

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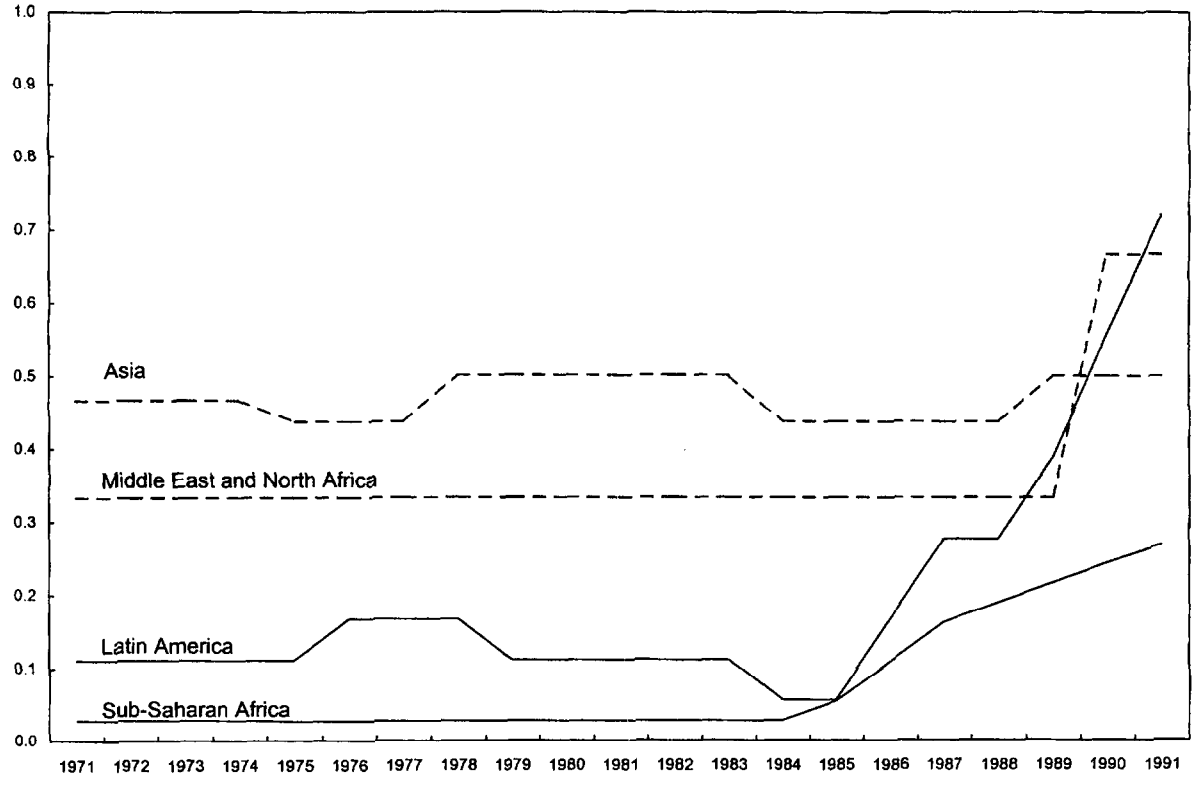
[12]In general, the Sachs-Warner estimates are available for 1970-92 for all of the countries in our sample except Equatorial Guinea, Syria, and Trinidad and Tobago.

[13]This switch may have occurred because the three countries for which the Sachs-Warner measure is not available are all primary product producers.

Figure 4. Trade Policies in Developing Country Regions
(Averages of the Sachs-Warner measure of trade policy openness)



Source: Sachs and Warner (1995).

IV. Conclusions

Given the size of our sample, the estimated gravity models do a remarkably good job of explaining the variation in bilateral trade between southern developing countries and northern industrial countries over the past quarter century. The estimated coefficients on the economic mass variable are significant and relatively stable across alternative specifications. The estimated coefficient is close to unity, indicating that, holding other things constant, trade tends to increase roughly proportionally with GDP in developing countries; if, however, GDP in both developing and industrial countries rises by 1 percent, bilateral trade between the two groups would increase by 2 percent. The estimates also suggest that, for a given level of GDP, trade levels tend to be lower in more populous countries, confirming the stylized fact that poorer countries tend to trade less than richer countries. These results are similar to those reported in previous studies (Frankel, 1997, Chapter 4). The estimated coefficients on geographical distance, however, are considerably smaller than reported in other studies,[14] partly reflecting the inclusion of population as a separate independent variable (compare equations (ii) and (iii) in Table 1).

Our empirical results indicate that Africa's relatively low level of bilateral trade with industrial countries mainly is due to the relatively small size of the average African economy and the relatively low rates of economic growth since 1970. As shown in Table 3, the economic mass determining the north-south trade of an average African country is only a fraction of the economic mass for typical developing countries in other regions. Moreover, while the economic mass has increased by a factor of 9 from the 1970s to the early 1990s for an average African country, it has increased by a factor of 15-20 in other regions.

Table 3. Gravity Determinants of North-South Trade
(Average value for a typical country)

		1970s	1980s	1990-95	1970s	1980s	1990-95
		Sub-Saharan Africa			Asia		
$TRADE_{ij}$	(US$ mil.)	46	79	93	209	764	1,909
Y_iY_j	(US$ bil.)	730	3,225	6,657	5,053	29,686	105,114
P_iP_j	(millions)	269	381	504	3,900	5,015	6,074
D_{ij}	(kilometers)		5,508			5,873	
		Latin America			Middle East and North Africa		
$TRADE_{ij}$	(US$ mil.)	116	264	541	121	366	817
Y_iY_j	(US$ bil.)	4,221	18,242	60,139	3,060	16,182	54,626
P_iP_j	(millions)	492	663	818	979	1,302	1,620
D_{ij}	(kilometers)		5,519			5,344	

[14]See Frankel (1997) and Foroutan and Pritchett (1993).

Other factors determining north-south bilateral trading patterns include the following:[15]

- **Population**. Holding other factors constant, a larger population is associated with lower levels of bilateral trade. The relatively small population of the average African country, therefore, tends to increase bilateral trade, although it is important to bear in mind the very low levels of GDP in the typical African country.

- **Geography**. The average geographical distance between northern and southern trading partners is remarkably similar across developing country regions and, hence, does not explain differences in trading patterns. As noted, however, sub-Saharan Africa has a large number of countries that are landlocked, which is an additional natural impediment to trade: the estimates reported in Table 2 suggest that, holding other things equal, countries that are landlocked trade on average about 70 percent less than countries that are not landlocked.

- **Language**. Linguistic and cultural ties boost bilateral trade between developing and industrial countries. Linguistic ties among French-speaking countries are the strongest: the estimation results suggest that bilateral trade between French-speaking countries is 210 percent higher than it is between countries with no linguistic ties; for Spanish-speaking countries, bilaterial trade is 88 percent higher, and for English-speaking countries it is 25 percent higher. The positive effect on bilateral trade with the north of these linguistic ties is strongest in Africa since virtually all of the African countries in our sample have either French- or English-language ties to industrial countries.[16]

- **Trade Policies**. As noted above, trade policies in African countries are considerably less open than are policies in other developing country regions, based on the Sachs-Warner measure (see Figure 4). The estimation results reported in Table 2 indicate that these policies have contributed to the relatively low level of bilateral trade between African countries and industrial countries. While trade policies have been liberalized in Africa since the mid-1980s, liberalization has gone much further in Latin America and in the Middle East and North Africa. In the early 1990s, African trade policies remained much less liberal than those of other developing country regions.

After taking account of the effects on trade from the above factors, we can address the question posed in the title of the paper: Is Africa's bilateral trade with the industrial countries unusual? There are two aspects to the answer, which are summarized in the combined country-specific fixed effects and country-specific time effects shown in Figure 3. **In terms of**

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[15]It is not clear whether being a primary commodity exporting country is associated with higher or lower levels of north-south trade.

[16]All Latin American countries also have linguistic ties, but these are typically to a single industrial country.

the level of north-south trade in the early 1990s, Africa is not unusual.[17] If anything, Africa overtrades compared with other developing country regions in the sense that its trade is higher than would be expected from the various determinants of bilateral trade. **In terms of changes over time, however, Africa is unusual**: the trend decline in African north-south trade over the past 25 years is in marked contrast to the estimated trend increase in Latin America and the broadly stable pattern in Asia. In the 1970s, Africa overtraded with the north compared with other developing country regions, but this overtrading has steadily declined and had largely disappeared by the early 1990s.

The pattern of Africa's bilateral trade with industrial countries could have implications for technology transfers. As shown in Figure 3, sub-Saharan Africa overtrades with industrial countries in Europe and, at least since the mid-1970s, undertrades with industrial countries in North America. Developing countries in Asia and Latin America, by contrast overtrade with North America and undertrade with Europe. To the extent that the United States is the technological leader, its products may embody higher levels of technology and, hence, trade with the United States could involve higher levels of technology transfers. Thus, developing countries in Africa may not have benefited as much as developing countries in Asia and Latin America from their bilateral trade with the industrial countries.[18]

In summary, while it is true that a number of African countries are landlocked, this natural impediment to trade is offset by linguistic and historic ties to French-and English-speaking countries in the north. It is also clear that, despite recent progress, sub-Saharan African countries, on average, remain relatively closed to international trade. There remains considerable scope, therefore, for broad-based trade liberalization measures to spur trade between African countries and industrial countries, thereby increasing opportunities for technology transfers. Finally, however, it is also clear that the fundamental source of the relatively low level of African trade with industrial countries compared with other developing country regions is the small size of most African economies and the relatively stagnant growth performance during the past two decades. Indeed, after controlling for the various determinants of bilateral trade—economic size, distance, population, access to the sea,

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[17]This conclusion is consistent with, and complements, Foroutan and Pritchett (1993), who conclude that the level of intra-African trade is normal, and Rodrik (1997), who concludes that the level of total African trade is normal.

[18]Simulations presented in Bayoumi, Coe, and Helpman (1998), for example, suggest that an increase in trade equivalent to 5 percentage points of GDP in developing countries would in the long run raise output by 8¼ percent in Latin America, compared with 6 percent in Africa. See also Coe, Helpman, and Hoffmaister (1997-- CHH) and Engelbrecht (1997), who reports that re-estimating the CHH equations excluding most African countries tends to increase the size of the estimated R&D spillover effects from industrial to developing countries, suggesting that African countries benefit less from technological transfers than do other developing countries.

linguistic ties, and the degree of openness—our empirical analysis suggests that Africa's trade is not at all unusual. What is unusual is that Africa actually overtraded with the north relative to other developing countries in the early 1970s, but the degree of overtrading has steadily declined over the past 25 years. This is one aspect of Africa's marginalization in international trade.

Data Appendix

Variable	Definition	Source
$TRADE_{ij}$	Sum of bilateral exports and imports between countries i and j (billions of current U.S. dollars).	Direction of Trade Statistics database
Y_i (Y_j)	GDP of country i (j) (billions of current U.S. dollars).	World Economic Outlook database
P_i (P_j)	Population of country i (j) (millions of inhabitants).	World Economic Outlook database
D_{ij}	Distance between the capital cities of countries i and j (kilometers).	Fitzpatrick and Modlin (1986)
LL_i	Dummy variable taking the value of one if country i is landlocked, and zero otherwise.	See Appendix Table 4
$PRIM_i$	Dummy variable taking the value of one if country i mainly exports primary commodities, and zero otherwise.	IMF (1997); see Appendix Table 4
$FRENCH_{ij}$ $SPANISH_{ij}$ $ENGLISH_{ij}$	Dummy variables taking the value of one if developing country i and industrial country j use, respectively, French, Spanish, or English as their official or main commercial language, and zero otherwise.	Katzner (1986); see Appendix Table 4
$TRADEPOL_i$	Dummy variable taking the value of one if country i's trade policies are open to international trade, as defined by Sachs and Warner (1995), and zero otherwise.	Sachs and Warner (1995)

Table 4. Regional Groupings

Sub-Saharan Africa		Asia		Latin America		Middle East and North Africa		Industrial	
Angola	Pr, Po	Bangladesh		Argentina	S	Algeria	F	*Asia*	
Benin	F	China		Bolivia	L, Pr, S	Egypt		Australia	E
Burkina Faso	L, F	Fiji	E	Brazil	Po	Jordan		Japan	
Burundi	L, Pr, F	Hong Kong, China	E	Chile	Pr, S	Malta	E	New Zealand	E
Cameroon	F	India	E	Colombia	S	Morocco	F/S		
Central African Rep.	L, Pr, F	Indonesia		Costa Rica	S	Oman	Pr	*Europe*	
Chad	L, Pr, F	Korea		Dominican Rep.	S	Syrian Arab Rep.	Pr, F	Austria	
Comoros	F	Malaysia		Ecuador	S	Tunisia	F	Belgium	F
Congo, Dem. Rep. of	Pr, F	Myammar	Pr	El Salvador	S	Turkey		Demark	
Congo, Rep of	Pr, F	Nepal	L	Guatemala	S			Finland	
Côte d'Ivoire	Pr, F	Pakistan		Guyana	Pr, E			France	F
Equatorial Guinea	Pr, S	Papua New		Haiti	F			Germany	
Ethiopia	L, Pr, E	Guinea	Pr, E	Honduras	Pr, S			Greece	
Gabon	Pr, F	Philippines	E	Mexico	S			Ireland	E
The Gambia	E	Singapore	E	Panama	S			Israel	
Ghana	Pr, E	Sri Lanka		Paraguay	L, S			Italy	
Guinea	Pr, F	Taiwan Province		Peru	S			Netherlands	
Guinea-Bissau	Pr, Po	of China		Trinidad and				Norway	
Kenya	E	Thailand		Tobago	Pr, E			Portugal	Po
Madagascar	Pr, F			Uruguay	S			Spain	S
Malawi	Pr, E			Venezuela	Pr, S			Sweden	
Mali	L, Pr, F							Switzerland	F
Mauritania	Pr, F								
Mauritius	F							*North America*	
Mozambique	Po							Canada	E
Niger	L, Pr, F							United States	E
Nigeria	Pr, E								
Rwanda	L, Pr, E								
Senegal	F								
Seychelles	E/F								
Sierra Leone	E								
South Africa	E								
Sudan	Pr								
Tanzania	Pr, E								
Togo	Pr, F								
Uganda	L, Pr, E								
Zambia	L, Pr, E								
Zimbabwe	L, Pr, E								

Notes: L and Pr indicate, respectively, that the country is landlocked or mainly exports primary commodities; E, F, S, and Po indicate, respectively, that the country's official or main commercial language is English, French, Spanish, or Portuguese.

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