Volume Title: Challenges to Globalization: Analyzing the Economics

Volume Author/Editor: Robert E. Baldwin and L. Alan Winters, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-262-03615-4

Volume URL: http://www.nber.org/books/bald04-1

Conference Date: May 24-25, 2002

Publication Date: February 2004

Title: Geography and Export Performance: External Market Access and Internal Supply Capacity

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URL: http://www.nber.org/chapters/c9535

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Geography and Export Performance: External Market Access and Internal Supply Capacity

Stephen Redding and Anthony J. Venables

3.1 Introduction

There have been wide variations in countries' export performance over the last quarter century. East Asian countries have seen real exports increase by more than 800 percent since the early 1970s, while those of sub-Saharan African have increased by just 70 percent. Across individual countries, real export growth varies from over 1,000 percent for the top five countries to minus 40 percent or worse for the bottom five. This divergent performance has raised concerns that although some countries are benefiting from globalization, others are, at best, passed by. It has also stimulated a huge debate about what lies behind the differences. Are certain countries excluded from major markets by virtue of their geography, their commodity specialization, or discriminatory trade policies? Is export performance beyond the control of governments, or are poorly performing countries largely responsible for their own fates with weak performance reflecting poor institutions and policies?

This paper investigates some of the determinants of divergent export performance, looking in particular at the roles of external and internal geography. This issue is not only of interest in itself, but, insofar as export

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This paper is produced as part of the globalization program of the U.K. Economic and Social Research Council (ESRC)-funded Centre for Economic Performance at the London School of Economics (LSE). Redding gratefully acknowledges financial support from a Philip Leverhulme prize. We are grateful to Robert Baldwin, Alan Winters and seminar participants at the National Bureau of Economic Research (NBER)-Center for Economic Policy and Research (CEPR) International Seminar in International Trade (ISIT) and the LSE for helpful comments. Martin Stewart provided able research assistance.

growth is thought to influence economic performance more generally, it is also of wider interest in identifying policy priorities nationally and internationally.[1] Whether or not globalization creates opportunities for all or whether or not some countries benefit more than others is clearly of paramount importance in shaping attitudes to globalization and the political economy of future rounds of international trade negotiations.

Geography may be expected to influence export performance in a number of ways. One way is through external geography—a country's location, in particular its proximity to rapidly growing export markets, and the consequent extent to which it is a recipient of international-demand linkages. For example, countries in Southeast Asia have been at the center of a fast growing region, which creates growing import demand. Given everything we know about the importance of distance as a barrier to trade, the export opportunities created by these growing import demands are likely to be geographically concentrated, creating spillover effects between countries in the region. Our first objective in this paper is to measure the strength of these effects. This we do by developing a theoretical model of bilateral trade flows and using gravity techniques to estimate the model's parameters. Each country's export growth can then be decomposed into two parts. One is based on the country's location relative to sources of import demands, which we call the country's foreign-market access. The other is due to changes within the country, which we call internal-supply capacity.

We find that a substantial part of the differential export growth of various countries and regions since 1970 can be attributed to variations in the rate at which their foreign-market access has grown. Changes in countries' foreign-market access arise because of changes in aggregate import demand from other countries—particularly countries that are close. There may also be particular regional effects arising, for example, from regional integration agreements. We capture these by refining our modeling to allow the intensity of intraregional trade to differ from trade as a whole. These effects are positive for Western Europe and negative for sub-Saharan Africa. They also exhibit significant changes through time, with increasing intraregional intensities in North America and in Latin America.

Having separated out the foreign-market access and internal-supply capacity contributions to export growth, our next objective is to investigate the determinants of each country's internal-supply capacity. We develop a simple theoretical structure to show how this depends on countries' internal geography (such as access to ports), on measures of their business environment (such as institutional quality), and also—in equilibrium—on their foreign-market access. The theoretical structure provides the basis for

1. There is, of course, an extensive debate on the relationship between trade and growth. See, for example, Sachs and Warner (1995) and Frankel and Romer (1999) for the positive case, and Rodriguez and Rodrik (2000) and Rodrik, Subramanian, and Trebbi (2002) for the case in which domestic institutions and policy are more important.

econometric estimation of countries' export performance as a function of these variables, and we find that all three characteristics are significant and quantitatively important. We use our results to explore the performance of different regions, and show how almost all of sub-Saharan Africa's poor export performance can be accounted for by poor performance in each of these dimensions.

The paper is organized as follows. The next section outlines a theoretical framework, and section 3.3 constructs the measures of foreign-market access and internal-supply capacity. The contribution of these measures to regions' export performance is reported, so too are interregional linkages, giving the contribution of each region to the foreign-market-access growth of every other region. Section 3.4 extends the analysis to a more detailed investigation of intraregional trade, showing how the intensity of this trade has changed through time. Section 3.5 endogenises each country's supply capacity. A simple theoretical framework is developed and provides the motivation for the export equation that we econometrically estimate to establish the effects of foreign-market access, internal geography, and institutions.

3.2 Theoretical Framework

A key feature of theoretical models of international trade in the presence of product differentiation and trade costs is the existence of a pecuniary-demand effect across countries. An increase in expenditure on traded goods in one country raises demand for traded goods in other countries, and, because of trade costs, the size of this effect is much greater for neighboring countries than for distant countries. How much of countries' differential export performances can be accounted for by variation in these demand conditions, and how much by differences in internal supply-side characteristics? Our main task in this paper is to separate these different forces and thereby identify the foreign-market access and internal-supply capacity of each country.

Performing this decomposition requires use of bilateral trade information in a gravity model. Gravity models offer an explanation of countries' trade flows in terms of exporter and importer country characteristics and between-country information, particularly distance. The gravity model is consistent with alternative theoretical underpinnings (see, e.g., Anderson 1979; Deardorff 1998; Eaton and Kortum 2002), and here we start by developing one of them—namely, a trade model based on product differentiation derived from a constant elasticity of substitution (CES) demand structure (see, e.g., Fujita, Krugman, and Venables 1999).

The world consists of $i = 1, \ldots, R$ countries whose tradeable-goods sectors produce a range of symmetric differentiated products. For the moment, we take the range of products produced in each country and their prices as exogenous; section 3.5 deals with general equilibrium. Demand for differentiated products is modeled in the usual, symmetric, constant elasticity of substitution way; σ is the elasticity of substitution between any pair of products, implying a CES utility function of the form,

$$U_j = \left[\sum_i^R n_i x_{ij}^{(\sigma-1)/\sigma} \right]^{\sigma/(\sigma-1)}, \quad \sigma > 1, \tag{1}$$

where n_i is the set of varieties produced in country i; x_{ij} is the country j consumption of a single product variety from this set, and all such varieties are symmetric.

Dual to this quantity aggregator is a price index in each country, G_j, defined over the prices of individual varieties produced in i and sold in j, p_{ij},

$$G_j = \left(\sum_i^R n_i p_{ij}^{1-\sigma} \right)^{1/(1-\sigma)}, \tag{2}$$

where we have again exploited the symmetry of products.

Given country j's total expenditure on differentiated products, E_j, its demand for each variety is (by Shephard's lemma on the price index)

$$x_{ij} = p_{ij}^{-\sigma} E_j G_j^{(\sigma-1)}. \tag{3}$$

Thus, the own-price elasticity of demand is σ, and the term $E_j G_j^{(\sigma-1)}$ gives the position of the demand curve in market j.

We assume that all country i varieties have the same producer price, p_i, and that the cost of delivery to market j gives price $p_{ij} = p_i t_i T_{ij} t_j$. Trade costs thus take the iceberg form, and t_i and t_j are the ad valorem cost factors in getting the product to and from the border in countries i and j, while T_{ij} is the cost of shipping the product between countries. Thus, t_i and t_j capture internal geography, and T_{ij} the external geography of trade flows.

The value of total exports of country i to country j is therefore

$$n_i p_i x_{ij} = n_i p_i^{1-\sigma} (t_i T_{ij} t_j)^{1-\sigma} E_j G_j^{\sigma-1}. \tag{4}$$

This equation for bilateral trade flows provides a basis for estimation of a gravity trade model. The right-hand side of this equation contains both importer and exporter country characteristics. The term $E_j(G_j/t_j)^{\sigma-1}$ is the market capacity of country j; it depends on total expenditure in j, on internal transport costs t_j, and on the number of competing varieties and their prices (summarized in the price index). On the supply side, the term $n_i(p_i t_i)^{1-\sigma}$ measures what we refer to as the supply capacity of the exporting country; it is the product of the number of varieties and their price competitiveness, such that doubling supply capacity (given market capacities) doubles the value of sales.[2] We will denote market capacity and supply capacity by m_i and s_i respectively, so

2. For further discussion of the concepts of market and supply capacity and the related concepts of market and supplier access introduced later, see Redding and Venables (2003).

(5) $$m_i \equiv E_i(G_i/t_i)^{\sigma-1}, \quad s_i \equiv n_i(p_i t_i)^{1-\sigma}.$$

From equation (4), bilateral trade flows can be expressed simply as the product of exporter supply capacity, importer market capacity, and the term $(T_{ij})^{1-\sigma}$, which measures bilateral transport costs between them

(6) $$n_i p_i x_{ij} = s_i(T_{ij})^{1-\sigma} m_j.$$

Empirically, supply capacity will capture all observed and unobserved characteristics of an exporting country i that affect its bilateral trade with all importers. Similarly, market capacity will capture all observed and unobserved characteristics of an importing country j that affect its bilateral trade with all exporters.

We are concerned with each country's overall export performance, that is, the value of its exports to all destinations, denoted V_i. This can be decomposed between supply capacity and foreign-market access by noting that,

(7) $$V_i = n_i p_i \sum_{j \neq i} x_{ij} = s_i \sum_{j \neq i} (T_{ij})^{1-\sigma} m_j = s_i M_i,$$

where M_i is the foreign-market access of country i,

(8) $$M_i \equiv \sum_{j \neq i} (T_{ij})^{1-\sigma} m_j.$$

This is simply the sum of the market capacities of all other countries j, weighted by the measure of bilateral trade costs of reaching each country.

Analogous to foreign-market access is the concept of foreign-supplier access, S_i, defined as the sum of the supply capacity of all other countries, weighted by the measure of bilateral trade costs in obtaining goods from each individual supplier j.

(9) $$S_i = \sum_{j \neq i} (T_{ij})^{1-\sigma} s_j$$

This measures proximity to sources of export supply, and the total value of imports of country i, Z_i, is the product of its market capacity and foreign-supplier access.

(10) $$Z_i = m_i S_i$$

Given observed values of total exports and imports, V_i and Z_i, and values of bilateral trade costs, $(T_{ij})^{1-\sigma}$, for R countries, equations (7) through (10) comprise a system of $4R$ equations in $4R$ unknowns (m_i, s_i, M_i, and S_i for all i). Solving these gives the required decomposition.[3] In particular, we can find each country's supply capacity, s_i, and foreign-market access, M_i,

3. Beginning from initial values for m_i, s_i, M_i, and S_i, we repeatedly solve the system formed by equations (7) through (8) for all R countries. Irrespective of initial conditions, the system rapidly converges to unique equilibrium values of m_i, s_i, M_i, and S_i.

giving the decomposition of exports that we seek, $V_i = s_i M_i$. However, doing this requires that we have values of bilateral trade costs, $(T_{ij})^{1-\sigma}$, as well as exports and imports, and it is to this matter that we now turn.

3.3 Sources of Export Growth: Decomposition

3.3.1 Data Sources and Gravity Estimation

Estimates of bilateral trade costs are derived from gravity estimation. We use data on the value of bilateral trade flows for 101 countries during the period 1970–1997, obtained from the NBER World Trade Database (Feenstra, Lipsey, and Bowen 1997; Feenstra 2001). Since we are concerned with the growth in the real value of countries' exports, the current dollar data in the NBER World Trade Database are deflated by the U.S. gross domestic product (GDP) deflator to obtain a measure of real trade flows. A country's market and supplier access depend on its trade with all other countries, and these trade data have the advantage of being available for a large cross section of countries. It is likely that there are substantial year-to-year fluctuations in bilateral trade flows—particularly for small countries—and we are concerned here with the determinants of long-run real export growth. Therefore, in the empirical analysis that follows, bilateral trade flows are averaged over four-year periods. With twenty-eight years of data, this yields seven periods of analysis. See the appendix for further details.

To obtain measures of bilateral trade costs, we estimate the gravity equation (6), which implies a relationship between bilateral trade, supplier capacity, and market capacity. The equation is estimated using bilateral distance and a dummy for whether or not countries share a common border. Supplier capacity and market capacity are controlled for respectively using an exporter-country and importer-partner dummy.[4] The estimation results are summarized in table 3.1, and we take the predicted values for bilateral trade costs from this equation as our measures of trade costs: Thus, $(\hat{T}_{ij})^{1-\sigma} = \text{dist}_{ij}^{\hat{\delta}} \cdot \exp(\hat{\gamma}\text{bord}_{ij})$, where dist_{ij} is the distance between a pair of countries i and j, and bord_{ij} is a dummy variable that takes the value of 1 if the two countries share a common border.

3.3.2 Export Growth Decompositions

We are now in a position to decompose each country's total exports into the contributions of supplier capacity and foreign-market access. The mea-

4. This specification is more general than the standard gravity model in which country and partner dummies are replaced by income and other country characteristics. In particular, the importer-partner dummies capture variation in the manufacturing price index G that is a determinant of market capacity m, and this specification thus controls for what Anderson and van Wincoop (2003) term "multilateral resistance." For a recent survey of alternative approaches to estimating the gravity equation, see Feenstra (2002).

Table 3.1 Bilateral Trade Equation Estimation (country and partner dummies)

$\ln(X_{ij})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
N	9,981	9,981	9,981	9,981	9,981	9,981	9,981
Period (years)	1970–73	1974–77	1978–81	1982–85	1986–90	1990–94	1994–97
$\ln(\text{dist}_{ij})$	–0.831	–0.866	–0.882	–0.883	–0.853	–0.866	–0.866
	(0.072)	(0.062)	(0.059)	(0.061)	(0.05)	(0.05)	(0.046)
bord_{ij}	0.532	0.494	0.483	0.449	0.528	0.607	0.688
	(0.179)	(0.157)	(0.154)	(0.16)	(0.146)	(0.151)	(0.152)
Country dummies	yes	yes	yes	yes	yes	yes	yes
Partner dummies	yes	yes	yes	yes	yes	yes	yes
Estimation	WLS	WLS	WLS	WLS	WLS	WLS	WLS
$F(\cdot)$	96.56	106.83	124.23	128.43	172	198.71	212.87
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.863	0.85	0.852	0.844	0.897	0.906	0.898
Root MSE	0.879	0.89	0.891	0.954	0.761	0.7	0.723

Notes: Huber-White heteroscedasticity robust standard errors in parentheses; $\ln(X_{ij})$ is log bilateral exports from country i to partner j plus one; $\ln(\text{dist}_{ij})$ is bilateral distance between countries i and j; and bord_{ij} is a dummy for whether or not the two countries share a common border. All specifications include exporting-country and importing-partner fixed effects. Observations are weighted by the product of country and partner GDP. N = number of observations; Prob. = probability; $F(\cdot)$ = F-statistic; WLS = weighted least squares; MSE = mean square error.

sures of trade costs derived above are combined with data on countries' total imports and exports to solve the system of simultaneous equations (7) through (10) for all countries' market capacities, supply capacities, foreign-market access, and foreign-supplier access. This implies, of course, that the product of each country's supply capacity and foreign-market access exactly equals its actual exports (and analogously on the import side in equation [10]), permitting an exact decomposition of actual export volumes.

An alternative approach would be to use the estimates of the exporter-country and importer-partner dummies obtained from the gravity equation as measures of market capacity and supply capacity. This approach was used in another context by Redding and Venables (2003) but, for the present purposes, has the disadvantage that the decomposition of *total* exports into foreign-market access and supply capacity would not then be exact. In practice, we find a high degree of correlation between measures of foreign-market access and supplier capacity constructed from solving the system of equations for all countries' total imports and exports and those constructed based on estimates from bilateral trade flows.[5]

5. The correlation across countries and over time between the measure of foreign-market access constructed from solving the system of equations for total exports and total imports and the measure based on estimated exporter and importer dummies from the gravity equation is 0.99. The corresponding correlations for market capacity and supplier capacity are 0.98.

The decomposition we undertake is extremely general. Although we derived $V_i = s_i M_i$ from a precise theoretical model, this decomposition holds for any theoretical model that yields a gravity equation of the form in equation (6), where bilateral trade is explained by exporting-country effects, importing-partner effects, and bilateral trade costs.

We begin by examining the evolution of foreign-market access and supply capacity. To provide a broad overview, we aggregate countries to nine geographical regions: Eastern Europe, Latin America, the Middle East and North Africa, North America, Oceania, Southeast Asia, Other Asia, sub-Saharan Africa, and Western Europe. Thus, $R(k)$ denotes the set of countries in region k, and the foreign-market access (FMA) of the region is simply the sum $M_{R(k)} \equiv \sum_{i \in R(k)} M_i$. Similarly, the supply capacity of the region is the sum of values for individual countries. The upper two panels of figures 3.1 and 3.2 display the evolution of regional FMA, while the lower two panels graph the time series of supply capacity. To control for regions having different numbers of countries, the figure graphs average values rather than totals. To clarify changes over time, we normalize supplier capacity so that it is expressed relative to its initial value.

At the beginning of the sample period, Eastern and Western Europe have the highest levels of FMA. The Eastern European position is not as surprising as it first seems because of its proximity to the countries of Western Europe. These regions are followed by North America. Looking at the upper right panel (and noting the vertical scale) the initial ranking then proceeds as Southeast Asia, Latin America, Other Asia, sub-Saharan Africa, and Oceania. The obvious features over time are the rapid growth of Southeast Asia and the acceleration of Other Asia in the second half of the sample period.

Turning now to export growth, the proportionate growth rates of supply capacity and FMA compound to the observed growth rate of exports.[6] Intuitively, the decomposition of export growth into these two components reveals the extent to which increases in a country's exports are due to improved own-country performance or external developments in trading partners. Appendix table 3A.1 reports the decomposition for each country, and table 3.2 of the text gives the regional aggregates. The first rows of table 3.2, the benchmark case, report the rate of growth of overall world exports in each period and the growth of supply capacity and market capacity that would be observed if all countries had identical export performance.

A number of results stand out. Southeast Asian countries experience export growth much faster than the benchmark in both periods. In the first period this was driven particularly by supply-capacity growth, and, in the

6. This is so because $V_i = s_i M_i$, $(1 + g_i^V) = (1 + g_i^s)(1 + g_i^M)$, where g is a proportional growth rate. When we aggregate to the regional level, this decomposition is no longer exact since $\sum_{i \in R(\ell)} V_i = \sum_{i \in R(\ell)} s_i M_i \neq \sum_{i \in R(\ell)} s_i \sum_{i \in R(\ell)} M_i$.

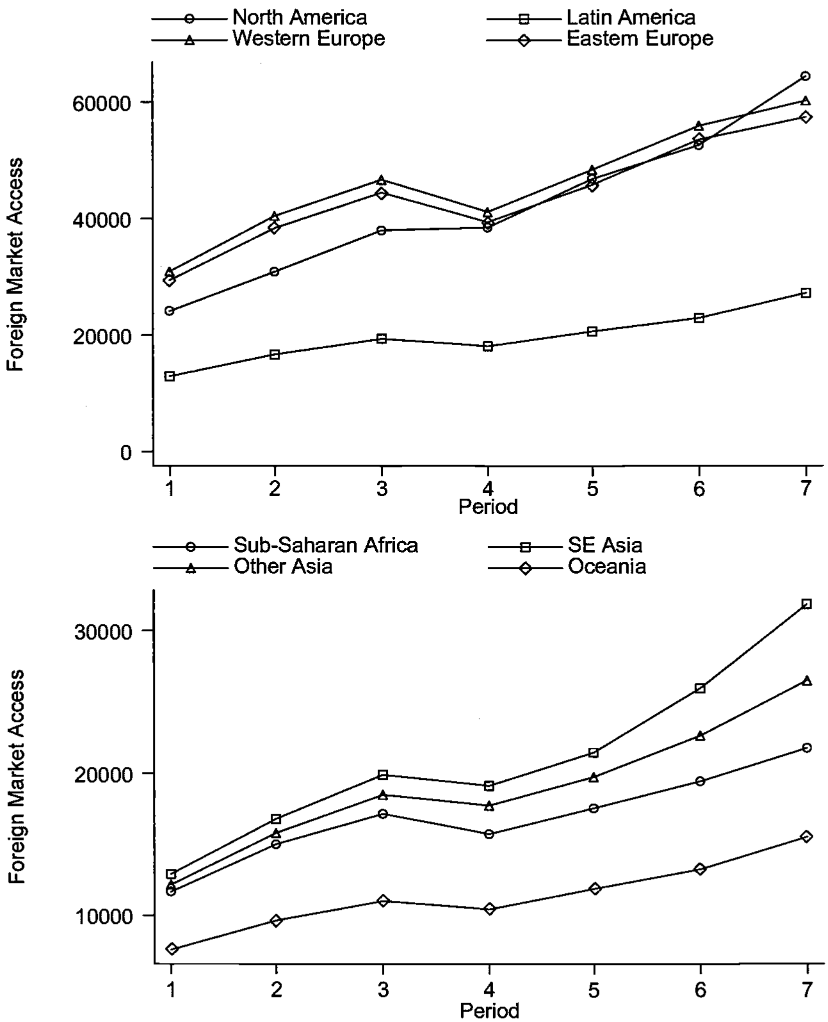

Fig. 3.1 Average regional FMA

second, FMA growth becomes relatively more important. Looking at individual countries in Southeast Asia (table 3A.1) shows that FMA growth was generally faster in the first period than in the second. For some of the earlier developers, supply-capacity growth slowed sharply in the second period (e.g., Japan, Taiwan, and Korea) while the later developers experienced a dramatic increase in second period supply-capacity growth (e.g., the Philippines, Thailand, and Vietnam).[7]

7. For a discussion of the commodity structure of East Asian export growth and its relationship to factor endowments and nonneutral technology differences, see Noland (1997).

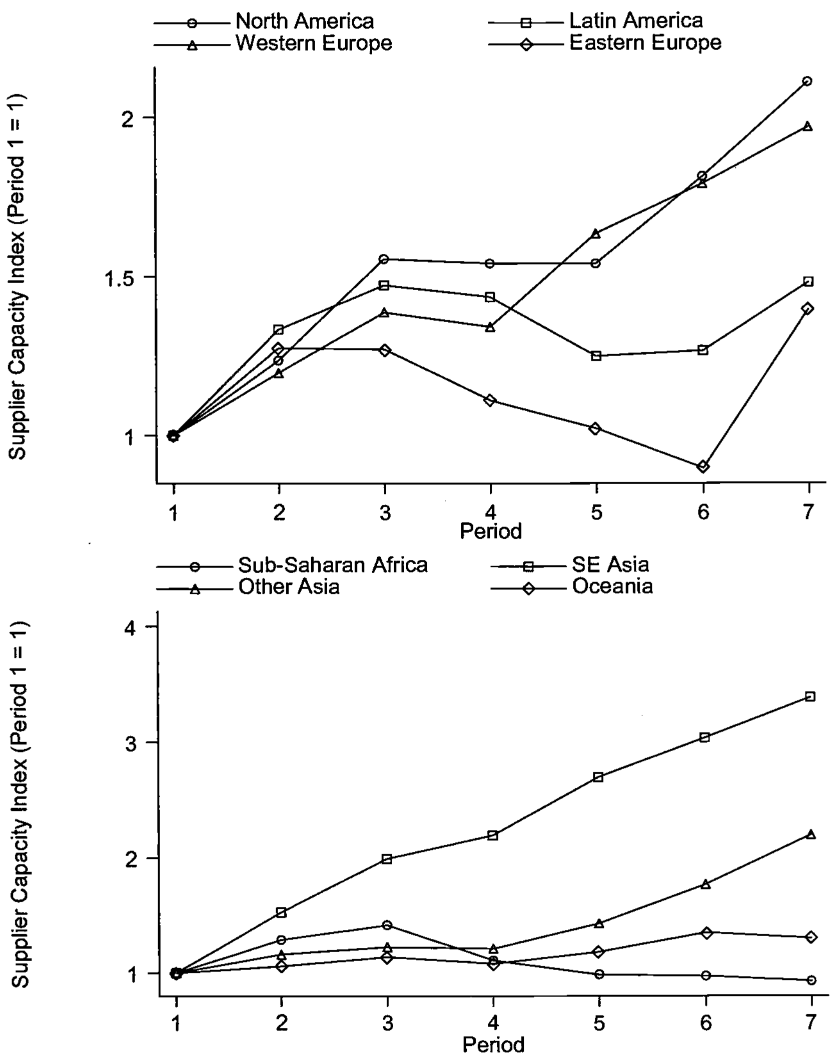

Fig. 3.2 Index of average regional supplier capacity

Other Asia experienced below-world-average export growth in the first period, but this is accounted for by significantly faster than benchmark market-access growth coupled with much slower than benchmark supply-capacity growth. This is in sharp contrast to the second period in which market-access growth close to the benchmark was associated with supply-capacity growth at twice the benchmark, giving overall export growth of nearly twice the world rate.

Latin America shows a different picture. Close to benchmark market-

Table 3.2 Regional Sources of Export Growth, 1970/1973–1994/1997, Percentage Rates of Growth

Region	Period (1)	Exports, V (2)	FMA, M (3)	Supplier Capacity, s (4)
Benchmark	Periods 1–7	326.3	106.5	106.5
	Periods 1–4	104.4	42.9	42.9
	Periods 4–7	108.5	44.5	44.5
North America	Periods 1–7	288.99	166.07	110.86
	Periods 1–4	92.74	59.42	54.00
	Periods 4–7	101.82	66.90	36.92
Latin America	Periods 1–7	193.32	110.82	48.11
	Periods 1–4	90.17	40.39	43.45
	Periods 4–7	54.24	50.17	3.25
Western Europe	Periods 1–7	269.37	94.29	96.82
	Periods 1–4	75.05	33.02	34.12
	Periods 4–7	111.01	46.06	46.75
Eastern Europe	Periods 1–7	187.43	94.84	39.62
	Periods 1–4	44.03	33.95	10.95
	Periods 4–7	99.56	45.45	25.84
Sub-Saharan Africa	Periods 1–7	70.38	86.44	–7.24
	Periods 1–4	54.18	34.71	10.80
	Periods 4–7	10.50	38.40	–16.28
North Africa and Middle East	Periods 1–7	189.77	102.82	41.20
	Periods 1–4	245.48	48.38	135.71
	Periods 4–7	–16.13	36.69	–40.10
Southeast Asia	Periods 1–7	826.17	146.35	238.04
	Periods 1–4	233.67	47.88	119.01
	Periods 4–7	177.57	66.59	54.35
Other Asia	Periods 1–7	371.95	117.80	119.31
	Periods 1–4	76.45	45.74	21.01
	Periods 4–7	167.48	49.44	81.23
Oceania	Periods 1–7	166.82	104.30	29.86
	Periods 1–4	48.35	37.34	7.89
	Periods 4–7	79.85	48.75	20.36

Notes: Periods 1–4 = 1970/1973–1982/1985; periods 4–7 = 1982/1985–1994/1997. Regional variables are the sum of those for countries within a region; see appendix for the countries included in each region. Columns (2) through (4) of the table are based on equation (7). Column (2) is the rate of growth of exports; column (3) is the rate of growth of FMA; and column (4) is the rate of growth of supplier capacity. The rates of growth of supplier capacity and FMA compound to the rate of growth of total exports. At the country level, this decomposition is exact. When we aggregate to regions, the decomposition is approximate since $\Sigma_{i \in R_k} V_i = \Sigma_{i \in R_k} s_i M_i \neq \Sigma_{i \in R_k} s_i \, \Sigma_{i \in R_k} M_i$.

access growth in both periods was associated with close to benchmark supply-capacity growth in the first period and weak growth in the second. Results for the Middle East and North Africa aggregate are dominated by oil exporters, and those for sub-Saharan Africa elaborate on a familiar story. Taking the two periods together, the contribution of FMA to sub-Saharan Africa's export growth was nearly 20 percentage points below the benchmark case, suggesting the importance of geographical location in explaining the region's poor export performance. However, supply capacity grew less fast than the benchmark in both periods, and positive export growth in the second period was achieved by market-access growth offsetting a reduction in supply capacity.

The main messages from this section are that both levels and rates of change of FMA vary widely across countries and regions. Foreign-market access levels in Western Europe are nearly three times those in sub-Saharan Africa. Thus, taking as given supplier capacity, FMA plays an important role in accounting for export performance. In general equilibrium, there will typically also be an endogenous response of supplier capacity to external conditions, and we consider this idea further in Section 3.5. Before doing so, we look in more detail at the regional structure of FMA growth.

3.3.3 Regional Effects

The decomposition of table 3.2 looks at each country's FMA growth, but does not divide the sources of this growth geographically. How much FMA growth do countries receive from the performance of other countries in their own region, and how much do they receive from growth in other regions? Out of these other regions, which ones are the more important?

A country's FMA can be divided according to geographical regions in which the markets are located and expressed as the sum of the access to markets in each region. Thus, if $M_i^{R(k)}$ is the market access derived by country i from region k, then

$$(11)\quad M_i^{R(k)} \equiv \sum_{j \in R(k)} (T_{ij})^{1-\sigma} m_j, \text{ and } M_i = M_i^{R(1)} + M_i^{R(2)} + \ldots + M_i^{R(K)}.$$

Changes in $\mathrm{M}_i^{R(k)}$ can be computed for each country, and the final two columns of table 3A.1 report, for each country, the FMA growth contributions from a country's own region and from other regions as a whole.

We concentrate on results not for individual countries, but for their regional groupings. Thus, $\mathrm{M}_{R(\ell)}^{R(k)}$ is the market access derived by all countries in region ℓ from region k, given by

$$(12)\quad M_{R(\ell)}^{R(k)} \equiv \sum_{i \in R(\ell)} M_i^{R(k)} \text{ and } M_{R(\ell)} = M_{R(\ell)}^{R(1)} + M_{R(\ell)}^{R(2)} + \ldots + M_{R(\ell)}^{R(K)}.$$

The change in the market access of region ℓ can be decomposed into the contribution of regions k according to

$$(13)\quad \frac{\Delta M_{R(\ell)}}{M_{R(\ell)}} = \left[\frac{M_{R(\ell)}^{R(1)}}{M_{R(\ell)}}\right]\left[\frac{\Delta M_{R(\ell)}^{R(1)}}{M_{R(\ell)}^{R(1)}}\right] + \ldots + \left[\frac{M_{R(\ell)}^{R(K)}}{M_{R(\ell)}}\right]\left[\frac{\Delta M_{R(\ell)}^{R(K)}}{M_{R(\ell)}^{R(K)}}\right],$$

where there are two components to the contribution of each region. Region R_k may make a large contribution to region R_ℓ's FMA growth either because it constitutes a large share of the region's FMA $[M_{R(\ell)}^{R(k)}/M_{R(\ell)}]$ or because there is rapid growth in market demand in the countries making up that region $[\Delta M^{R(k)}_{R(\ell)} / M^{R(k)}_{R(\ell)}]$.

Results are reported in table 3.3, panel A for the period as a whole, and in panels B and C for the two subperiods.[8] Reading across the first row of the tables we see that North America derived virtually all of its FMA growth from itself. This reflects the fact that Canada's FMA is large relative to that of the United States (FMA captures access to markets *other* than one's own), and the United States constitutes an extremely large share of Canada's FMA. Canada benefits much more from being located close to the United States than the United States benefits from being located close to Canada, and own-region FMA growth in Canada thus accounts for over 98 percent of total Canadian FMA growth.

Latin America was much more dependent on FMA growth from outside the region—almost entirely so in the first period. Of these extra-regional sources, North America is far and away the most important. Turning to Europe, Western Europe provides a major source of FMA growth both for itself and for Eastern Europe.

The striking features of sub-Saharan Africa are the negative contribution of the own-region effect and the lack of a dominant external source of FMA growth. Over the period as a whole, North America was the most important, followed by Western Europe, with the Middle East and North Africa playing a noticeable role in the first subperiod.

The Asian figures illustrate two main points. One is the dominant role of intraregional linkages within Southeast Asia, and the other is the growth in the importance of Southeast Asia for Other Asia. This arises partly from the growing import demands of Southeast Asia and partly also from the westwards expansion of economic activity in the Southeast Asia region. It is also interesting to look down the Southeast Asia column in table 3.3, panel A, indicating the contribution of this region to FMA growth in other regions; the region now provides a major potential source of demand for African exports.

3.4 Regional Trade Intensities

In the gravity model used so far, trade frictions between countries are measured simply by distance and whether or not the countries share a common border. In this section, we present a brief exploration of the importance of regional trading by allowing the costs of trading within a region to differ from those of trading between regions.

To allow trade costs to vary in this way, we augment the distance and

8. Note that this decomposition of FMA growth shares features with the literature concerned with a shift-share analysis of countries' export growth (see, e.g., Richardson 1971), although it uses our theoretically based measures.

Table 3.3 Percentage Growth Contributions of Partner Regions to the Growth of Foreign Market Access of Each Exporting Region

Exporter	Importer: FMA (all regions)	North America	Latin America	Western Europe	Eastern Europe	Sub-Saharan Africa	North Africa and the Middle East	Southeast Asia	Other Asia	Oceania
A. Periods 1–7 (1970/1973–1994/1997)										
North America	166.07	141.42	3.22	9.53	0.29	–0.43	1.30	9.82	0.33	0.59
Latin America	110.82	59.11	19.32	13.99	0.42	–0.86	2.18	14.93	0.55	1.19
Western Europe	94.29	15.49	1.45	61.91	2.01	–0.53	2.90	10.15	0.50	0.41
Eastern Europe	94.84	14.38	1.44	60.67	2.99	–0.57	3.66	11.21	0.60	0.45
Sub-Saharan Africa	86.44	27.24	4.57	23.79	0.75	–2.44	6.00	23.84	1.36	1.34
North Africa and Middle East	102.82	20.36	2.35	33.04	1.08	–1.08	23.91	20.67	1.65	0.83
Southeast Asia	146.35	19.10	2.18	13.04	0.46	–0.72	3.40	104.67	1.88	2.34
Other Asia	117.80	21.29	2.56	19.43	0.71	–1.02	7.67	58.39	7.10	1.67
Oceania	104.30	29.99	5.13	13.18	0.44	–1.02	3.22	46.60	1.26	5.49
B. Periods 1–4 (1970/1973–1982/1985)										
North America	59.42	51.56	0.35	2.36	–0.11	–0.22	1.84	3.22	0.25	0.18
Latin America	40.39	27.89	1.42	3.17	–0.17	–0.48	3.07	4.72	0.41	0.36
Western Europe	33.02	7.42	0.01	18.07	–0.27	–0.17	4.20	3.24	0.40	0.12

Eastern Europe	33.95	6.81	–0.00	18.28	–0.35	–0.17	5.22	3.57	0.48	0.13
Sub-Saharan Africa	34.71	12.55	–0.06	6.20	–0.25	–1.03	8.58	7.23	1.08	0.41
North Africa and Middle East	48.38	9.50	–0.03	10.32	–0.24	–0.32	21.09	6.45	1.37	0.25
Southeast Asia	47.88	8.54	–0.12	2.88	–0.19	–0.49	4.82	30.18	1.39	0.86
Other Asia	45.74	9.62	–0.12	4.81	–0.25	–0.59	10.73	16.86	4.13	0.55
Oceania	37.34	13.10	–0.24	2.32	–0.22	–0.81	4.51	15.30	0.95	2.43
C. Periods 4–7 (1982/1985–1994/1997)										
North America	66.90	56.37	1.81	4.50	0.25	–0.13	–0.34	4.14	0.05	0.26
Latin America	50.17	22.23	12.75	7.71	0.42	–0.27	–0.64	7.27	0.10	0.59
Western Europe	46.06	6.07	1.08	32.96	1.71	–0.27	–0.98	5.19	0.08	0.22
Eastern Europe	45.45	5.65	1.08	31.65	2.50	–0.30	–1.16	5.71	0.09	0.24
Sub-Saharan Africa	38.40	10.90	3.44	13.06	0.75	–1.05	–1.91	12.33	0.21	0.69
North Africa and Middle East	36.69	7.32	1.60	15.31	0.89	–0.51	1.91	9.59	0.19	0.39
Southeast Asia	66.59	7.14	1.56	6.87	0.43	–0.16	–0.96	50.37	0.33	1.00
Other Asia	49.44	8.01	1.84	10.03	0.66	–0.29	–2.10	28.50	2.04	0.77
Oceania	48.75	12.30	3.91	7.91	0.48	–0.15	–0.94	22.79	0.23	2.23

Notes: A region's FMA is the sum of the values of FMA for all countries within that region. Regional FMA growth is decomposed into the percentage contributions of each partner region using equations (12) and (13). The exporting region is reported in the rows of the table and the importing partner in the columns.

border effects with dummies for whether or not two countries lie within the same geographical region. Thus the measure of bilateral trade costs becomes $(T_{ij})^{1-\sigma} = \text{dist}_{ij}^{\hat{\theta}} \cdot \exp(\hat{\gamma}\text{bord}_{ij})\prod_k \exp(\hat{\phi}_k \text{region}_{kk})$, where $\hat{\phi}_k$ is the estimated coefficient on the dummy for whether or not countries i and j lie within region k. This specification allows for differences in trade costs on within-region transactions and between-region transactions in a general way that imposes minimal structure on the data. At the same time, we are able to analyze how the coefficient on the within-region trade dummy changes over time and relate these changes to explicit policy-based attempts at regional integration, including, for example, the North American Free Trade Agreement (NAFTA) and the European Union (EU).

The results of estimating the gravity equation including the within-region trade dummies are reported in table 3.4. As shown in the table, the within-region trade dummies are jointly statistically significant at the 10 percent level in all periods, and their level of joint statistical significance increases markedly over time. The dummies capture anything that affects the ease of trading within the region, and therefore it is not surprising that some of the estimated coefficients are negative, particularly at the beginning of the sample period. Sub-Saharan Africa is a case in point, where a recent literature has emphasized the importance of physical geography and infrastructure in explaining trade and development in Africa (see, e.g., Amjadi, Reincke, and Yeats 1996; Gallup, Sachs, and Mellinger 1998; Limao and Venables 2001). Africa has few east-west navigable rivers to facilitate water-borne trade within the continent, and there is much evidence of low levels of transport infrastructure investment that may have a particularly severe impact on within-region trade. International political conflict and patterns of specialization clearly also play a role. For example in the Middle East, within-region conflict and the importance of petroleum exports to industrialized countries outside the region generate a negative estimated within-region effect.

Over time, we observe a systematic increase in the estimated values of almost all the within-region effects. This provides evidence of the increasing regionalization of international trade that does not rely on a particular parameterization of the regional integration process. Nonetheless, one important explanation for increasing regionalization is clearly the proliferation of regional preferential trade agreements. This is particularly clear for North America. Here, at the beginning of the sample period, we find a negative within-region effect, which may reflect policies of import substitution in Mexico that particularly restricted within-region trade or the fact that the largest cities of Canada and United States (on which our measures of distance are based) are closer than the true economic centres (taking into account the whole distribution of economic activity). Nevertheless, over time, we observe a rise in the estimated within-region effect that is both

Table 3.4 **Bilateral Trade Equation Estimation and Within-Region Trade Costs (country and partner dummies)**

	Period						
$\ln(X_{ij})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
N	9,981	9,981	9,981	9,981	9,981	9,981	9,981
Period (years)	1970–73	1974–77	1978–81	1982–85	1986–89	1990–93	1994–97
$\ln(\text{dist}_{ij})$	–0.669	–0.69	–0.71	–0.779	–0.704	–0.688	–0.74
	(0.089)	(0.077)	(0.076)	(0.081)	(0.071)	(0.075)	(0.086)
bord_{ij}	0.778	0.659	0.578	0.526	0.488	0.416	0.401
	(0.145)	(0.124)	(0.119)	(0.12)	(0.112)	(0.113)	(0.118)
Within North America	–0.467	–0.277	–0.205	–0.333	–0.019	0.417	0.543
	(0.289)	(0.271)	(0.281)	(0.278)	(0.273)	(0.327)	(0.335)
Within Latin America	–0.531	–0.278	–0.168	–0.013	0.313	0.626	0.58
	(0.233)	(0.202)	(0.201)	(0.209)	(0.191)	(0.201)	(0.24)
Within Western Europe	0.565	0.642	0.732	0.657	0.811	0.876	0.802
	(0.161)	(0.14)	(0.135)	(0.142)	(0.13)	(0.142)	(0.172)
Within Eastern Europe	1.038	–0.274	3.424	4.139	4.014	2.409	1.817
	(1.452)	(1.75)	(0.305)	(0.28)	(0.261)	(0.212)	(0.256)
Within Sub-Saharan Africa	–3.913	–4.067	–4.849	–5.615	–5.2	–1.485	–1.334
	(0.586)	(0.609)	(0.609)	(0.525)	(0.449)	(0.316)	(0.322)
Within North Africa and	–2.972	–4.225	–4.903	–4.257	–4.073	–3.631	–3.381
Middle East	(0.658)	(0.595)	(0.704)	(0.664)	(0.683)	(0.804)	(0.853)
Within Southeast Asia	0.852	0.638	0.225	–0.174	–0.217	–0.232	–0.382
	(0.297)	(0.272)	(0.265)	(0.293)	(0.223)	(0.219)	(0.23)
Within Other Asia	–4.65	–0.715	–0.422	–0.574	–0.86	–0.356	–1.278
	(1.637)	(0.751)	(0.962)	(0.773)	(0.788)	(0.634)	(0.789)
Within Oceania	0.929	1.09	1.214	0.965	1.177	1.483	1.591
	(0.525)	(0.429)	(0.431)	(0.339)	(0.289)	(0.29)	(0.39)
Country dummies	yes	yes	yes	yes	yes	yes	yes
Partner dummies	yes	yes	yes	yes	yes	yes	yes
Estimation	WLS	WLS	WLS	WLS	WLS	WLS	WLS
Prob. > F(dummies)	0.077	0.011	0.005	0.004	0.000	0.000	0.000
Prob. > $F(\cdot)$	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.868	0.856	0.859	0.853	0.903	0.912	0.904
Root MSE	0.864	0.873	0.869	0.933	0.736	0.677	0.701

Notes: Huber-White Heteroscedasticity robust standard errors in parentheses; $\ln(X_{ij})$ is log bilateral exports from country i to partner j plus one; $\ln(\text{dist}_{ij})$ is log bilateral distance between countries i and j; and bord_{ij} is a dummy for whether or not the two countries share a common border. All specifications include exporting-country and importing-partner fixed effects. Within North America is a dummy that takes the value of 1 if *both* trade partners lie within North America and zero otherwise. The other within-region dummies are defined analogously. Prob $>$ F(dummies) is the p-value for a F-test of the null hypothesis that the coefficients on the regional dummies are jointly equal to zero. Prob $> F(\cdot)$ is the p-value for a F-test of the null hypothesis that all coefficients are jointly equal to zero. Since the within-region dummies exploit bilateral information, they are separately identified from the country and partner fixed effects. Observations are weighted by the product of country and partner GDP. To capture the effects of NAFTA, Mexico is included in the definition of North America. N = number of observations; Prob. = probability; $F(\cdot)$ = F-statistic; WLS = weighted least squares; MSE = mean square error.

large and statistically significant. Thus, the estimated coefficient becomes positive in the period 1990–1993 during which NAFTA was signed.

The exception is Southeast Asia where the intraregional effect diminishes sharply through time. This does not reflect diminishing intraregional trade, but rather the particularly rapid growth of trade with countries outside the region. Thus, it shows the extent to which the region's trade was becoming more externally rather than internally oriented over the period.

Other examples of the importance of trade policy in shaping regional integration include Western and Eastern Europe. In Western Europe, we again observe a systematic rise in the estimated within-region effect over time. In Eastern Europe, the value of the within-region effect follows an inverted U-shape, rising between the 1970s and 1980s consistent with the policies of the Council for Mutual Economic Cooperation (COMECON) in stimulating trade within the former Soviet bloc and declining markedly in the 1990s following the fall of the Berlin Wall and the abandonment of the COMECON system of public procurement and trading preferences.

3.5 Determinants of Export Performance

We have so far undertaken decompositions based on the identity that a country's exports are the product of its supply capacity, s_i, and FMA, M_i. We now turn to the next stage of the analysis—asking what determines supply capacity? We expect that it depends on a number of underlying country characteristics including country size, endowments, and internal geography. It will also depend, in equilibrium, on FMA, since this is one of the variables that determines the potential return to exporting. Our objective in this section is to econometrically estimate the importance of these factors. We contribute to a growing literature on the role of geography in determining the ratio of trade to income and trade performance more generally (see, e.g., Ciccone and Alcalá 2001; Frankel and Romer 1999; Leamer 1988; Radelet and Sachs 1998; Wei 2000).

3.5.1 Theory

In order to endogenize supply capacity, we have to add to the material of section 3.2 some general equilibrium structure of the economy. We do this in a very compact way by simply specifying a supply curve for exports, implying that as the quantity of exports produced in a country increases, so does their price. Using our previous analysis, the quantity of exports demanded from country i, $n_i x_i = n_i \sum_{j \neq i} x_{ij}$, is given by

$$n_i x_i = \frac{s_i M_i}{p_i} = n_i (p_i)^{-\sigma} (t_i)^{1-\sigma} M_i \qquad (14)$$

(using equations [4] and [8]). The supply relationship we specify by the function Ω is

$$n_i x_i = a_i \Omega(p_i/c_i), \quad \Omega' > 0. \tag{15}$$

We assume that the function Ω is the same for all countries, but add country-specific parameters c_i and a_i to the relationship; c_i is a measure of comparative costs in the export sector of country i, and a_i is a measure of the size of the economy. This is a general equilibrium relationship capturing the opportunity cost of resources used in the export sector. Expanding the volume of exports produced moves the economy around the production-possibility frontier, increasing the price of exports. Thus, as the export sector expands, it draws resources out of other sectors of the economy—the import-competing and nontradeable-activities sectors. Drawing resources out of other sectors tends to bid up their prices, raising costs and hence price in the export sector.

Cross-country variation is captured by linearization of these relationships. Logarithmically differentiating equations (14) and (15) gives

$$\hat{x} = -\sigma\hat{p} + (1-\sigma)\hat{t} + \hat{M}, \tag{16}$$

$$\hat{n} + \hat{x} = \hat{a} + \omega(\hat{p} - \hat{c}),$$

where ω is the price elasticity of export supply and ^ denotes a proportional deviation from some reference point. Eliminating the price term gives

$$\hat{x}(\omega + \sigma) + \sigma\hat{n} = \omega[\hat{M} - \sigma\hat{c} + (1-\sigma)\hat{t}] + \sigma\hat{a}. \tag{17}$$

The total value of exports, $V_i = n_i p_i x_i = s_i M_i$ (equation [7]), varies according to

$$\hat{V} = \hat{n} + \hat{p} + \hat{x} = \hat{a} - \hat{c}\omega + [M + (1-\sigma)\hat{t} - \hat{x}]\frac{(1+\omega)}{\sigma}, \tag{18}$$

where the second equation uses equation (16). One further step is needed, which is to specify whether export volumes vary through changes in the number of varieties, n, or through output per variety, x. In a standard monopolistic-competition model equilibrium, output per commodity is a constant, $\hat{x} = 0$; in which case, equation (18) is

$$\hat{V} = \hat{a} - \hat{c}\omega + [\hat{M} + (1-\sigma)\hat{t}]\frac{(1+\omega)}{\sigma}. \tag{19}$$

At the other extreme, if the number of varieties that can be produced by a country is fixed, $\hat{n} = 0$, then using equations (17) in (18) gives

$$\hat{V} = \frac{\{(\sigma - 1)(\hat{a} - \hat{c}\omega) + [\hat{M} + (1-\sigma)\hat{t}](1+\omega)\}}{(\sigma + \omega)}. \tag{20}$$

These equations form the basis of the econometric investigation, with variation in terms provided by cross-country observations. Notice that the coefficient on FMA in these equations is not generally equal to unity, reflecting the endogeneity of supply capacity. Thus if σ is large relative to ω

(or, in the second equation if $\sigma > 1$), then the coefficient on $\hat{M}$ is less than unity. High levels of FMA are associated with a less than proportional increase in exports and a lower level of supply capacity (since $V_i = s_i M_i$). This arises because increased demand for exports encounters diminishing returns in the domestic-supply response, bidding up p_i. The coefficient on $\hat{M}$ is smaller for low values of ω, this measuring a more tightly curved production-possibility frontier and lower supply elasticity.

Other terms in the equations are as would be expected. Cross-country variation in internal geography is captured by $\hat{t}$, entering with negative coefficient providing $\sigma > 1$. Domestic size, $\hat{a}$, increases the value of exports, although not necessarily proportionately. And a high-cost export sector, $\hat{c} > 0$, means that a lower volume of exports is supplied for a given price.

3.5.2 Estimation

Motivated by the theoretical analysis of the previous section (equations [19] and [20]), we estimate the following empirical specification.

$$\ln(V_i) = \beta_0 + \beta_1 \ln(\text{GDP}_i) + \beta_2 \ln(\text{Pop}n_i) + \beta_3 \ln(M_i) + \beta_4 \ln(t_i) + \beta_5 c_i + \mu_k + \varepsilon_i \tag{21}$$

The dependent variable is the log of the value of exports. The log of GDP and of population are included as two separate measures of country size, and M_i is FMA as calculated in section 3.3; t_i represents the internal geography of the country and is measured empirically using the percentage of the population living within 100 kilometers of the coast or navigable rivers (see appendix for sources).

To capture the comparative costs of exporting in each country, c_i, we use a measure of institutional quality, as has been widely used in the cross-country growth literature (see, e.g., Acemoglu, Johnson, and Robinson 2001; Hall and Jones 1999; Knack and Keefer 1997). The measure is an index of the protection of property rights and risk of expropriation (see appendix), and a higher value of the index corresponds to better institutional quality.

We also include a full set of dummies for the nine geographical regions, μ_k, in order to control for unobserved heterogeneity across regions in the determinants of export performance, including other unobserved institutions, features of technology, and characteristics of regions.

Before presenting estimates of equation (21), a number of points merit discussion. First, the measure of FMA (M) included on the right-hand side as a determinant of countries' export performance has itself been constructed from the export data. It is constructed from the solution of a system of simultaneous equations for all countries' total exports and total imports, and any individual country's exports enter this system of simultaneous equations as just one out of the $2R$ observations on exports and imports. A country's FMA depends on market capacities in all *other* countries, weighted by bilateral trade costs (equation [8]). Nevertheless, to ensure that shocks to an individual country's exports are not driving our measure of FMA, we also construct for each country an alternative measure that completely excludes information on the country's own exports. In this alternative measure, M^*, we exclude one country i at a time and solve the system of equations in equations (7) to (10) for the $R - 1$ other countries $j \neq i$ (excluding information on country i's exports to and imports from these other countries). This yields measures of market capacity and supplier capacity in all other countries $j \neq i$. The alternative FMA measure for country i is then constructed as the trade-cost-weighted sum of these market capacities. We repeat the analysis for all countries $i \in R$. This alternative measure provides a robustness check, and the measure turns out to be very highly correlated with the FMA measure of section 3.3.

Second, the income term, GDP_i, may itself be endogenous. We consider two approaches to this problem. First, we impose a theoretical restriction that $\beta_1 = 1$ and take as the dependent variable the export-income ratio, V_i/GDP_i. In this specification, we focus on the ability of the explanatory variables to explain variation in the share of exports in GDP. Second, we use lagged values of GDP_i for the independent variable. We estimate equation (21) using the cross-sectional variation in the data and focus on the final time period 1994–1997. Here, the corresponding lagged income variable is 1990–1993.

Third, our primary interest in this section is not consistently estimating the structural parameters of equation (21). Rather, our main concern is conditioning on the right-hand side variables and examining how much of the cross-country variation in export performance can be statistically explained by these considerations and how much remains unexplained in the regional dummies.

Estimation results are reported in table 3.5. The first column gives our base specification, using the lagged GDP variable. As expected, the coefficient on GDP is positive and highly significant, although also significantly less than unity, reflecting the fact that large economies are less open than smaller ones. This suggests that working with the ratio of exports to GDP as dependent variable would be inappropriate. The other size measure, population, is insignificant.

We find a positive and statistically significant effect of both external and internal geography in determining exports. The coefficient on $\ln(M)$ is significantly less than unity, indicating that an increase in FMA increases exports less than proportionately. This is in line with the preceding theoretical discussion as the expansion in exports raises costs and prices in the sector, thereby reducing supply capacity. This finding is also consistent with earlier work (Redding and Venables 2003; Overman, Redding, and Venables 2003), which shows that a higher level of FMA is associated with

Table 3.5 The Role of Internal Geography, External Geography, and Institutions in Determining Export Performance, 1994–1997

	(1)	(2)	(3)	(4)
Dependent variable	ln(*V*)	ln(*V*/GDP)	ln(*V*)	ln(*V*/GDP)
Period (years)	1994–97	1994–97	1994–97	1994–97
No. of observations	95	95	95	95
ln[GDP(1991–93)]	0.734		0.730	
	(0.052)		(0.051)	
ln(population)	–0.038	–0.262	–0.025	–0.256
	(0.057)	(0.043)	(0.057)	(0.043)
ln(*M*)	0.46	0.479	0.342	0.298
	(0.195)	(0.205)	(0.119)	(0.127)
Population within 100km coast and rivers (%)	0.581	0.416	0.596	0.441
	(0.191)	(0.061)	(0.187)	(0.199)
Institutional quality	0.202	0.023	0.198	0.016
	(0.062)	(0.387)	(0.061)	(0.061)
Region effects	yes	yes	yes	yes
Estimation	OLS	OLS	OLS	OLS
	$F(13,81) = 137.600$	$F(12,82) = 7.732$	$F(13,81) = 142.200$	$F(12,82) = 7.747$
Prob > *F*	0.000	0.000	0.000	0.000
R^2	0.957	0.531	0.958	0.531

Notes: Standard errors in parentheses. Columns (1) and (2), FMA is as computed in section 3.3. Columns (3) and (4), FMA is computed omitting own country, M^*.

higher wages. The coefficient on the proportion of population within 100 kilometers of the coast or a navigable river is also significant and positive, capturing internal geography. Similar results are obtained if the proportion of population is replaced by the proportion of land area. The measure of institutional quality (risk of expropriation) has a positive and statistically significant effect on export performance, consistent with an important role for the protection of property rights in determining countries ability to export.

The second column of table 3.5 gives results for the specification with the export ratio taken as the independent variable. Coefficients on ln(M) and on internal geography are similar to those in the first column. However, the population term becomes negative and significant, and the coefficient on institutional quality becomes smaller and insignificant. The fact that smaller economies tend to export less is being captured by the negative coefficient on population and perhaps also by a positive correlation between institutional quality (now with a smaller coefficient) and per capita income.

Columns (3) and (4) repeat the exercise with the alternative measure of FMA discussed above, M^*. Signs and significance levels are unchanged using this alternative variable. The size of the coefficient on ln(M^*) is some-what smaller than that on $\ln(M)$, although the difference is not statistically significant at conventional critical values.

3.5.3 Effects by Region

We use these econometric estimates to shed light on patterns of export performance across the nine geographical regions. To what extent are the divergent performances of these regions explained by this model, and which of the independent variables are more important in explaining the variation in performance across regions?

The expected value of exports by region k relative to the expected value for the world, $E_{i\in R(k)} \ln(V_i) - E_i \ln(V_i)$, can be expressed as a linear function of regional deviations in independent variables multiplied by their estimated coefficients. Formally, regression equation (21) implies that

$$(22) \quad E_{i\in R(k)} \ln(V_t) - E_i \ln(V_i) = \alpha_k(a) + \alpha_k(M) + \alpha_k(t) + \alpha_k(c) + \mu_k,$$

where μ_k is the regional dummy of equation (21), and remaining terms are the regional contributions of the independent variables.

$$(23) \quad \begin{aligned} \alpha_k(a) &= \beta_1[E_{i\in R(k)} \ln(\text{GDP}_i) - E_i \ln(\text{GDP}_i)] \\ &\quad + \beta_2[E_{i\in R(k)} \ln(\text{Pop}n_i) - E_i \ln(\text{Pop}n_i)], \\ \alpha_k(M) &= \beta_3[E_{i\in R(k)} \ln(M_i) - E_i \ln(M_i)], \\ \alpha_k(t) &= \beta_4[E_{i\in R(k)} \ln(t_i) - E_i \ln(t_i)], \\ \alpha_k(c) &= \beta_5[E_{i\in R(k)} c_i - E_i c_i]. \end{aligned}$$

Thus, $\alpha_k(M) \equiv \beta_3[E_{i\in R(k)} \ln(M_i) - E_i \ln(M_i)]$ is region k's FMA, relative to that of the world, multiplied by the estimated coefficient on FMA. Terms $\alpha_k(t)$ and $\alpha_k(c)$ are the analogous measures for internal geography and institutions, while size effects are combined in $\alpha_k(a)$.

We illustrate results for each region in figure 3.3, where values are based on the estimates given in the first column of table 3.5. The first bar in each of the regional boxes, labeled $\alpha_k(V)$, is the region's export performance relative to the world average once size effects have been conditioned out, $\alpha_k(V) \equiv E_{i\in R(k)} \ln(V_i) - E_i \ln(V_i) - \alpha_k(a)$. Remaining bars sum to this first bar, since they divide $\alpha_k(V)$ into four components (see equation [22]). Bars two to four give the contributions of FMA (M), internal geography (t), and institutions (c), respectively. The residual, after controlling for these factors, is the regional dummy μ_k, illustrated as the final bar in each chart.

What do we learn from this decomposition? North America (including Mexico) has high trade relative to the world, given its income and population. This is explained partly by relatively good market access and partly by institutions. It is offset by relatively poor internal geography, leaving a

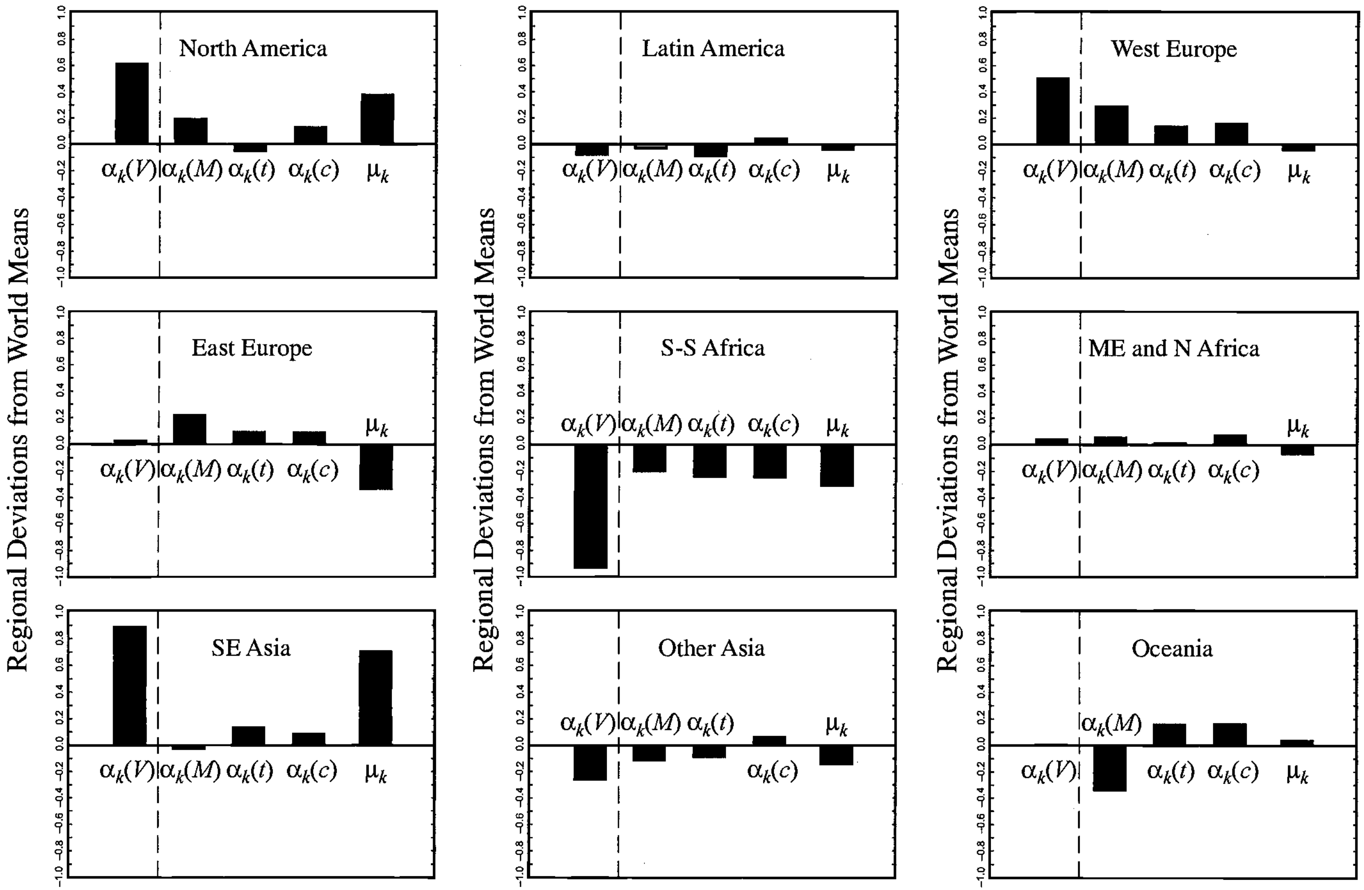

Fig. 3.3 Regional export performance, 1994–1997

Note: Contributions of foreign-market access $\alpha_k(M)$; internal geography $\alpha_k(t)$; institutions $\alpha_k(c)$; and residual μ_k.

substantial unexplained residual. Western Europe's high level of exports is accounted for by a combination of good market access, good internal geography, and good institutions, leaving virtually nothing to the residual dummy variable. For Eastern Europe, the benefits of good market access and better than average internal geography and institutions are not fully reflected in the actual level of trade, leaving a large negative regional dummy. This is consistent with the idea that the legacy of communism during the postwar period has had a long-lasting effect on Eastern Europe's exports, captured here in the regional dummy. The outcome for Oceania combines low market access with good internal geography and institutions.

Sub-Saharan African has low trade volumes given its income level, and these are accounted for by below average performance on all three measures together with some negative residual. Thus, each of $\alpha_k(M)$, $\alpha_k(t)$, $\alpha_k(c)$ and μ_k account for between 20 percent and 30 percent of sub-Saharan Africa's low level of trade after conditioning on country size, $\alpha_k(V)$. At the other extreme is the performance of Southeast Asia, with high trade levels only partly explained by good institutions and internal geography. There remains a large positive residual, in part due to the entrepôt activities of Hong Kong and Singapore and in part due to aspects of the Asian Miracle that are not captured by our approach.

3.6 Concluding Comments

The changes in countries' export performance over recent decades are symptomatic, at least, of the extent to which they have succeeded in benefiting from globalization. The real value of world exports doubled between the early 1970s and mid-1980s and doubled again from the mid-1980s to late 1990s. In the second of these periods, Latin American exports went up by just 54 percent, sub-Saharan Africa's went up by 10 percent, and those of the Middle East and North Africa fell by 16 percent.

This paper takes some steps towards understanding the determinants of cross-country variation in both the levels and growth of exports. There are several main findings. First, geography creates substantial cross-country variation in the ease of access to foreign markets, and this is an important determinant of countries' export performance. For example, once country size factors are controlled for, sub-Saharan Africa has poor export performance, about one-quarter of which is attributable to its poor foreign-market access. Furthermore, the growth of FMA varied widely across regions during the periods we studied. This accounted for some of the poor performance of regions, such as sub-Saharan Africa, not neighbored by countries with fast-growing import demand.

Second, export performance also depends on internal geography, which is measured in this paper by the proportion of the population close to the coast or navigable rivers. Looking at sub-Saharan Africa again, another one-quarter of its poor export performance is accounted for by this variable.

Finally, export performance also depends on many other domestic supply-side factors. This paper takes a small step towards analysis of these by looking at the role of institutional quality in determining exports. This, as it turns out, accounts for a further one-quarter of sub-Saharan Africa's low export levels. Perhaps the main contribution of this paper is to show how to measure and control for the external and internal geographic factors that shape performance. Our hope is that, once these are successfully controlled for, then research will be better able to identify domestic factors (some of them subject to policy control) that also determine export performance.

Appendix

Data

- Bilateral Trade: Data on bilateral trade flows are from the NBER World Trade database. Declared by U.S. GDP deflator
- GDP per capita: Data on current price (U.S.$), GDP, and on population are from the World Bank. Deflated by U.S. GDP deflator
- Geographical variables: Data on bilateral distance, existence of a common border (from the World Bank)
- Physical geography: Data on proportion of land and population close to coast or navigable rivers from Gallup, Sachs, and Mellinger (1998; the data can be downloaded from http://www.2.cid.harvard.edu/ciddata)
- Institutions: Expropriation risk from International Country Risk Guide database
- Regional groupings:

  North America—Canada, the United States, and Mexico

  Latin America and the Caribbean—Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Nicaragua, Panama, Peru, Trinidad and Tobago, Uruguay, and Venezuela

  Western Europe—Austria, Belgium (including Luxembourg), Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom

  Eastern Europe—Albania, Bulgaria, Czechoslovakia, Hungary, Poland, and Romania

Sub-Saharan Africa—Angola, Benin, Cameroon, Côte d'Ivoire, Cameroon, Ethiopia, Gabon, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Morocco, Nigeria, Senegal, South Africa, Sudan, Tanzania, Uganda, Zaire, Zambia, and Zimbabwe

Middle East and North Africa—Algeria, Egypt, Iran, Israel, Jordan, Kuwait, Lebanon, Morocco, Oman, Saudi Arabia, Syria, Tunisia, and United Arab Emirates

Southeast Asia—Cambodia, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, Papua New Guinea, Philippines, Singapore, Taiwan, and Thailand

Other Asia—Bangladesh, India, Sri Lanka, Nepal, and Pakistan

Oceania—Australia and New Zealand

Table 3A.1 Country Sources of Export Growth and the Regional Concentration of Foreign-Market-Access Growth (%)

Country	Period (1)	Supply Capacity (2)	FMA (3)	Exports (4)	Own Region FMA (5)	Other Region FMA (6)
		North America				
Canada	1970/73–1982/85	2.71	73.91	78.62	69.4	4.5
	1982/85–1994/97	2.46	70.61	74.81	65.3	5.3
Mexico	1970/73–1982/85	307.49	46.72	497.87	36.3	10.4
	1982/85–1994/97	56.81	65.22	159.09	48.8	16.4
The United States	1970/73–1982/85	52.56	20.65	84.06	3.3	17.3
	1982/85–1994/97	37.90	49.10	105.61	19.4	29.7
		Latin America				
Argentina	1970/73–1982/85	3.96	29.04	34.15	0.5	28.5
	1982/85–1994/97	41.04	63.79	131.01	30.3	33.5
Bolivia	1970/73–1982/85	13.40	29.65	47.02	–1.6	31.2
	1982/85–1994/97	–35.03	59.35	3.53	24.8	34.6
Brazil	1970/73–1982/85	105.77	31.49	170.58	–1.6	33.1
	1982/85–1994/97	–6.65	51.21	41.16	14.1	37.1
Chile	1970/73–1982/85	18.58	28.77	52.70	–2.0	30.8
	1982/85–1994/97	83.77	56.08	186.83	19.9	36.2
Colombia	1970/73–1982/85	23.71	40.40	73.69	3.3	37.1
	1982/85–1994/97	53.89	46.69	125.74	11.7	35.0
Costa Rica	1970/73–1982/85	4.72	45.78	52.65	5.1	40.7
	1982/85–1994/97	62.72	45.46	136.68	8.3	37.2
Dominican Republic	1970/73–1982/85	–10.00	49.76	34.78	2.7	47.1
	1982/85–1994/97	108.67	40.72	193.64	3.3	37.4
Ecuador	1970/73–1982/85	151.37	39.19	249.88	2.0	37.2
	1982/85–1994/97	–8.07	48.06	36.11	11.1	37.0
El Salvador	1970/73–1982/85	–28.01	44.20	3.81	2.2	42.0
	1982/85–1994/97	–18.40	48.24	20.97	8.6	39.6

(*continued*)

Table 3A.1 (continued)

Country	Period (1)	Supply Capacity (2)	FMA (3)	Exports (4)	Own Region FMA (5)	Other Region FMA (6)
Guatemala	1970/73–1982/85	–0.24	45.09	44.75	2.2	42.9
	1982/85–1994/97	–16.50	56.30	30.51	7.3	49.0
Haiti	1970/73–1982/85	180.97	48.56	317.41	2.2	46.3
	1982/85–1994/97	–81.19	43.96	–72.92	6.8	37.2
Honduras	1970/73–1982/85	6.25	44.23	53.24	2.1	42.1
	1982/85–1994/97	–36.84	46.62	–7.40	7.7	38.9
Jamaica	1970/73–1982/85	–43.36	50.44	–14.79	2.9	47.6
	1982/85–1994/97	3.69	42.64	47.90	4.4	38.3
Nicaragua	1970/73–1982/85	–51.99	44.38	–30.69	2.7	41.7
	1982/85–1994/97	–24.25	47.62	11.82	9.1	38.6
Panama	1970/73–1982/85	–14.80	42.78	21.64	1.8	41.0
	1982/85–1994/97	6.19	47.03	56.12	9.4	37.7
Peru	1970/73–1982/85	–10.25	35.59	21.69	1.2	34.4
	1982/85–1994/97	–1.93	53.90	50.92	17.7	36.2
Trinidad and Tobago	1970/73–1982/85	40.46	44.13	102.44	3.0	41.2
	1982/85–1994/97	–52.42	41.09	–32.87	4.6	36.5
Uruguay	1970/73–1982/85	52.02	15.49	75.57	–6.4	21.9
	1982/85–1994/97	–7.14	87.22	73.85	58.5	28.7
Venezuela	1970/73–1982/85	39.69	43.63	100.63	1.9	41.8
	1982/85–1994/97	–32.04	47.58	0.30	10.6	37.0
		Western Europe				
Austria	1970/73–1982/85	44.54	28.48	85.71	16.8	11.7
	1982/85–1994/97	58.77	54.54	145.37	39.8	14.7
Belgium (incl. Luxembourg)	1970/73–1982/85	11.74	33.90	49.62	24.9	9.0
	1982/85–1994/97	45.43	48.24	115.58	40.5	7.8
Denmark	1970/73–1982/85	22.67	31.32	61.09	19.6	11.7
	1982/85–1994/97	34.43	50.51	102.34	39.6	10.9
Finland	1970/73–1982/85	37.30	30.62	79.33	12.0	18.6
	1982/85–1994/97	77.39	40.70	149.60	23.6	17.1
France	1970/73–1982/85	27.92	29.60	65.79	18.0	11.6
	1982/85–1994/97	43.09	52.71	118.51	42.6	10.1
Germany	1970/73–1982/85	27.51	28.29	63.59	14.5	13.8
	1982/85–1994/97	37.36	49.64	105.55	32.3	17.3
Greece	1970/73–1982/85	65.23	40.26	131.76	15.4	24.9
	1982/85–1994/97	20.21	39.84	68.11	23.5	16.4
Ireland	1970/73–1982/85	102.15	34.20	171.28	18.6	15.6
	1982/85–1994/97	133.79	45.39	239.91	32.1	13.3
Italy	1970/73–1982/85	40.84	34.67	89.67	15.2	19.5
	1982/85–1994/97	61.49	43.50	131.74	28.5	15.0
The Netherlands	1970/73–1982/85	32.22	32.16	74.74	21.5	10.7
	1982/85–1994/97	19.07	46.99	75.02	37.5	9.5
Norway	1970/73–1982/85	93.16	31.80	154.59	15.0	16.8
	1982/85–1994/97	22.67	40.04	71.79	24.8	15.2
Portugal	1970/73–1982/85	21.12	38.31	67.52	16.1	22.2
	1982/85–1994/97	125.85	49.78	238.28	32.5	17.3

Table 3A.1 (continued)

Country	Period (1)	Supply Capacity (2)	FMA (3)	Exports (4)	Own Region FMA (5)	Other Region FMA (6)
Spain	1970/73–1982/85	100.36	35.68	171.84	15.1	20.5
	1982/85–1994/97	116.11	41.68	206.18	26.2	15.5
Sweden	1970/73–1982/85	5.65	33.87	41.43	16.0	17.9
	1982/85–1994/97	39.53	40.54	96.10	24.3	16.2
Switzerland	1970/73–1982/85	33.72	31.84	76.30	20.5	11.4
	1982/85–1994/97	43.52	51.53	117.47	41.7	9.8
Turkey	1970/73–1982/85	129.06	36.75	213.24	11.8	24.9
	1982/85–1994/97	87.06	35.69	153.82	19.2	16.5
The United Kingdom	1970/73–1982/85	36.68	38.55	89.38	22.7	15.8
	1982/85–1994/97	36.49	35.09	84.38	22.0	13.1
		Eastern Europe				
Albania	1970/73–1982/85	84.57	36.57	152.07	0.0	36.5
	1982/85–1994/97	–43.46	37.34	–22.35	1.3	36.0
Bulgaria	1970/73–1982/85	27.01	35.56	72.17	–0.7	36.3
	1982/85–1994/97	–9.33	43.17	29.81	3.0	40.2
Czechoslovakia	1970/73–1982/85	2.86	31.08	34.83	–0.5	31.6
	1982/85–1994/97	77.54	54.48	174.26	2.9	51.6
Hungary	1970/73–1982/85	–11.31	34.92	19.66	–0.6	35.5
	1982/85–1994/97	44.67	41.52	104.73	3.3	38.2
Poland	1970/73–1982/85	–0.44	31.34	30.76	–0.2	31.5
	1982/85–1994/97	57.83	49.69	136.25	1.8	47.8
Romania	1970/73–1982/85	47.75	37.74	103.52	0.1	37.6
	1982/85–1994/97	–28.69	38.34	–1.36	2.4	35.9
		Sub-Saharan Africa, North Africa, and Middle East				
Angola	1970/73–1982/85	14.67	30.48	49.62	–2.8	33.3
	1982/85–1994/97	13.81	37.95	57.01	–1.9	39.9
Benin	1970/73–1982/85	4.81	36.35	42.91	3.1	33.2
	1982/85–1994/97	–5.98	32.10	24.21	–4.9	37.0
Cameroon	1970/73–1982/85	154.00	37.41	249.03	3.7	33.7
	1982/85–1994/97	–53.45	31.61	–38.73	–5.1	36.7
Côte d'Ivoire	1970/73–1982/85	30.17	32.94	73.04	–1.5	34.5
	1982/85–1994/97	–22.83	39.04	7.30	–1.1	40.1
Ethiopia	1970/73–1982/85	–33.83	41.87	–6.12	–0.8	42.7
	1982/85–1994/97	–29.71	35.62	–4.68	–0.9	36.5
Gabon	1970/73–1982/85	169.54	35.08	264.10	0.9	34.2
	1982/85–1994/97	–16.34	34.97	12.92	–3.5	38.4
Ghana	1970/73–1982/85	–51.31	35.75	–33.90	1.5	34.2
	1982/85–1994/97	35.02	35.38	82.80	–3.3	38.6
Guinea	1970/73–1982/85	134.95	33.49	213.63	–1.9	35.4
	1982/85–1994/97	–23.31	39.84	7.25	–1.2	41.0
Kenya	1970/73–1982/85	29.93	36.42	77.24	–1.8	38.2
	1982/85–1994/97	–12.85	38.40	20.61	–0.5	38.9
Madagascar	1970/73–1982/85	–37.96	35.22	–16.11	–1.5	36.7
	1982/85–1994/97	–50.35	42.61	–29.19	0.0	42.6

(*continued*)

Table 3A.1 (continued)

Country	Period (1)	Supply Capacity (2)	FMA (3)	Exports (4)	Own Region FMA (5)	Other Region FMA (6)
Malawi	1970/73–1982/85	20.67	30.46	57.43	–3.6	34.0
	1982/85–1994/97	–18.21	40.66	15.05	0.3	40.4
Mali	1970/73–1982/85	–88.27	36.63	–83.97	0.5	36.1
	1982/85–1994/97	–12.42	38.54	21.33	–1.3	39.9
Mauritius	1970/73–1982/85	37.04	36.29	86.77	–1.5	37.7
	1982/85–1994/97	97.37	43.71	183.63	–0.5	44.2
Mozambique	1970/73–1982/85	–75.03	27.47	–68.17	–3.5	30.9
	1982/85–1994/97	–56.84	43.73	–37.96	4.1	39.6
Nigeria	1970/73–1982/85	122.31	35.22	200.60	–1.0	36.2
	1982/85–1994/97	–49.43	39.04	–29.69	–0.7	39.7
Senegal	1970/73–1982/85	–13.97	35.84	16.87	–1.3	37.1
	1982/85–1994/97	–48.02	40.77	–26.83	–0.9	41.6
South Africa	1970/73–1982/85	–6.22	34.18	25.83	–1.2	35.4
	1982/85–1994/97	33.19	44.56	92.54	–0.5	45.1
Sudan	1970/73–1982/85	–42.06	43.21	–17.02	–0.8	44.1
	1982/85–1994/97	–67.13	34.88	–55.67	–0.5	35.4
Tanzania	1970/73–1982/85	–48.49	34.51	–30.72	–2.3	36.8
	1982/85–1994/97	–29.50	39.75	–1.48	0.0	39.7
Uganda	1970/73–1982/85	–48.21	35.19	–29.98	–1.8	37.0
	1982/85–1994/97	–27.45	37.45	–0.28	–0.6	39.0
Zaire	1970/73–1982/85	–34.05	33.43	–12.00	–0.9	34.3
	1982/85–1994/97	–54.51	37.86	–36.87	–1.3	39.2
Zambia	1970/73–1982/85	–67.90	33.14	–57.26	–0.8	33.9
	1982/85–1994/97	–49.35	41.39	–28.38	1.6	39.8
Zimbabwe	1970/73–1982/85	341.18	24.27	448.27	–6.8	31.1
	1982/85–1994/97	19.76	41.05	68.92	1.7	39.3
Algeria	1970/73–1982/85	203.95	37.06	316.59	5.7	31.4
	1982/85–1994/97	–51.74	40.67	–32.12	0.4	40.3
Egypt	1970/73–1982/85	85.79	40.23	160.54	13.8	26.4
	1982/85–1994/97	–36.75	40.37	–11.21	0.4	36.2
Iran	1970/73–1982/85	131.64	48.88	244.86	18.8	30.0
	1982/85–1994/97	–50.45	37.76	–31.74	–2.9	40.7
Israel	1970/73–1982/85	30.83	59.69	108.92	34.2	25.5
	1982/85–1994/97	130.86	23.37	184.80	–7.5	30.9
Jordan	1970/73–1982/85	312.61	46.86	505.96	26.9	20.0
	1982/85–1994/97	–20.10	50.75	20.46	24.4	26.4
Kuwait	1970/73–1982/85	–5.83	72.11	62.07	44.9	27.2
	1982/85–1994/97	–60.10	22.24	–51.23	–8.8	31.0
Lebanon	1970/73–1982/85	–42.87	51.98	–13.17	27.6	24.4
	1982/85–1994/97	–41.90	35.03	–21.45	4.0	31.1
Morocco	1970/73–1982/85	8.57	38.31	50.16	6.6	31.8
	1982/85–1994/97	17.92	40.40	65.56	–1.9	42.3
Oman	1970/73–1982/85	153.43	63.84	315.21	33.8	30.0
	1982/85–1994/97	–18.49	37.80	12.32	3.0	34.8

Table 3A.1 (continued)

Country	Period (1)	Supply Capacity (2)	FMA (3)	Exports (4)	Own Region FMA (5)	Other Region FMA (6)
Saudi Arabia	1970/73–1982/85	181.50	42.94	302.39	15.1	27.8
	1982/85–1994/97	–55.62	42.06	–36.96	3.7	38.3
Syria	1970/73–1982/85	107.20	41.39	192.95	18.5	22.9
	1982/85–1994/97	8.35	42.70	54.62	9.6	33.1
Tunisia	1970/73–1982/85	134.51	38.48	224.75	7.8	30.7
	1982/85–1994/97	59.91	34.60	115.24	–2.3	36.9
United Arab	1970/73–1982/85	510.10	63.88	899.83	34.9	29.0
Emirates	1982/85–1994/97	–27.55	26.40	–8.42	–7.8	34.2
		Southeast and Other Asia				
Cambodia	1970/73–1982/85	–95.59	38.73	–93.89	22.4	16.4
	1982/85–1994/97	3187.36	85.00	5981.78	69.7	15.3
China	1970/73–1982/85	149.75	47.05	267.26	31.3	15.7
	1982/85–1994/97	208.31	62.89	402.20	48.0	14.9
Hong Kong	1970/73–1982/85	127.59	47.08	234.75	29.3	17.8
	1982/85–1994/97	184.02	67.31	375.21	51.2	16.1
Indonesia	1970/73–1982/85	291.97	45.78	471.92	27.1	18.7
	1982/85–1994/97	–4.76	63.79	55.99	46.0	17.8
Japan	1970/73–1982/85	91.49	45.33	178.30	19.4	26.0
	1982/85–1994/97	10.83	70.04	88.46	44.9	25.2
Korea,	1970/73–1982/85	361.86	50.83	596.65	35.3	15.6
Republic of	1982/85–1994/97	113.44	44.47	208.37	30.4	14.1
Malaysia	1970/73–1982/85	97.90	62.23	221.05	47.0	15.3
	1982/85–1994/97	85.98	87.44	248.59	75.1	12.3
Papua New	1970/73–1982/85	83.12	40.37	157.04	20.0	20.4
Guinea	1982/85–1994/97	37.54	50.31	106.73	28.2	22.1
Philippines	1970/73–1982/85	24.96	47.43	84.24	30.2	17.2
	1982/85–1994/97	64.21	60.92	164.25	44.8	16.2
Singapore	1970/73–1982/85	201.65	45.31	338.34	27.9	17.5
	1982/85–1994/97	123.47	74.01	288.86	58.0	16.0
Taiwan	1970/73–1982/85	201.47	53.89	363.93	37.2	16.7
	1982/85–1994/97	85.18	64.30	204.26	49.5	14.8
Thailand	1970/73–1982/85	111.71	44.20	205.30	24.3	19.9
	1982/85–1994/97	230.18	60.93	431.34	43.6	17.3
Viet Nam	1970/73–1982/85	3.95	48.86	54.74	31.0	17.9
	1982/85–1994/97	844.27	70.77	1512.52	55.0	15.7
Bangladesh	1970/73–1982/85	132.16	45.29	237.32	3.7	41.6
	1982/85–1994/97	114.21	53.24	228.26	2.1	51.2
India	1970/73–1982/85	20.29	45.17	74.61	2.7	42.5
	1982/85–1994/97	89.57	48.34	181.20	1.1	47.2
Nepal	1970/73–1982/85	–2.75	45.52	41.52	4.6	40.9
	1982/85–1994/97	114.41	53.92	230.02	2.5	51.4
Pakistan	1970/73–1982/85	13.46	48.16	68.10	5.8	42.4
	1982/85–1994/97	55.26	43.67	123.07	3.6	40.1
Sri Lanka	1970/73–1982/85	7.04	44.18	54.34	3.6	40.6
	1982/85–1994/97	52.39	48.27	125.94	0.5	47.7

(*continued*)

Table 3A.1 (continued)

Country	Period (1)	Supply Capacity (2)	FMA (3)	Exports (4)	Own Region FMA (5)	Other Region FMA (6)
		Oceania				
Australia	1970/73–1982/85	9.21	37.74	50.43	0.6	37.1
	1982/85–1994/97	20.59	49.90	80.77	0.6	49.3
New Zealand	1970/73–1982/85	2.81	36.97	40.81	4.2	32.8
	1982/85–1994/97	19.38	47.66	76.29	3.8	43.9

Notes: Columns (2) through (4) of the table are based on equation (7). Column (2) is the rate of growth of supplier capacity (s); column (3) is the rate of growth of foreign-market access (FMA); and column (4) is the rate of growth of exports. The rates of growth of supplier capacity and FMA compound to the rate of growth of total exports. Columns (5) and (6) are based on equation (13). Column (5) reports the contribution of a country's own region FMA growth, while column (6) gives the corresponding contribution of other-region FMA growth.

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Comment Keith E. Maskus

I would like to congratulate Steve Redding and Tony Venables on providing another solid contribution that helps establish a useful empirical context for analyzing how processes of geography, trade, and growth fit together. They do this by offering a decomposition of changes in the value of exports over several time periods into changes arising from domestic supply capacity (coming from size, as a measure of endowments, internal trade costs, and an index of the quality of governance) and from foreign

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market access (FMA; coming from bilateral trade costs and foreign market demand).

This approach is straightforward and appealing. It generates sensible results that reinforce our basic understanding of the sources of export growth in various regions. For example, sub-Saharan Africa (SSA) has performed worse than the world average in every factor but it is clear that weakness in institutions (protection of property rights) is particularly important in restraining supply capacity. For another, East Asia saw greatly expanded market access in the 1980s but also subsequently developed large average increases in domestic supply capacity. Finally, market access within North America is itself largely responsible for export growth within that region. The paper reminds us that both FMA and supply capacity are important, a significant message for developing countries hoping to succeed through export-led growth. Simply observing larger foreign market growth may not raise exports much without reducing domestic supply costs.

Again, I appreciate the approach for being straightforward and easy to implement if one has the data. However, I would like to raise a few questions about the inevitable simplifications that must be made in order to get the approach to work.

First, is it really the case that supply-capacity factors and FMA are so neatly separable that they can be treated without considering any interactions between them? Here is one obvious example, consistent with the globalization theme of this conference, although many others could be suggested. Suppose that a particular country finds that all its export markets increase their effective access by cutting trade barriers. Under some circumstances this might induce more inward foreign direct investment (FDI) into low-wage countries, a direct increase in supply capacity. It could also generate an indirect expansion of capacity through enhancing competition and learning spillovers. In such a case we might not be attributing enough export-growth impact to FMA.

Clearly sorting out such interrelationships would require a different kind of model structure and would not lend itself to readily available measures. However, I think more effort to entertain such interrelationships could be rewarding and perhaps could help explain the many large residuals that show up in the later regional export-growth decompositions.

Second, a related point is that while the decomposition of supply capacity growth into its determinants is quite useful, it leaves room for much more work. For example, even given the same growth in size and institutional capacity, an economy that is more open to technology flows may have greater capacity growth. Here, an important concept that goes unmeasured and unused in the paper is *technology distance,* or how costly it is to transfer and absorb advanced technology from abroad. This process depends on a number of market features, such as market competition, access to science and technology information, regulation of technology transfer, skill endowments, and so on. Consider, for example, a country with an effective telecommunications structure that permits ready access to Internet-based science. That country is likely to increase its supply capacity more rapidly in response to growth in foreign knowledge (and therefore demand) than would be a country with a weak telecommunications infrastructure.

Third, I find it surprising that the measure of trade costs, coming from the inclusion of distance and border dummies into a gravity equation of trade, does not explicitly account for trade barriers, especially tariffs. To an important degree, such trade restrictions are embedded into the general gravity equation. However, it would be useful for policy purposes to say something explicit to African policymakers about the nature of their trade costs. If the problem is simply that they are far from export markets, which is an important observation made by the authors, there is not much that can be done about that basic geography. But if distance were needlessly augmented by high trade barriers a completely different policy message would emerge.

Fourth, how readily can we make inferences about policy changes from the results presented? The authors find large market access effects in North America and attribute this to the effects of NAFTA and to earlier Mexican trade liberalization. It is conceivable, however, that NAFTA itself was an endogenous response to regional trade growth and may indeed be diverting some trade relative to an underlying export trend. This is an important question, for the implicit message in the paper is favorable to regional trade agreements. This message cannot readily be supported simply on the basis of the results here.

Fifth, I wonder about the endogeneity of some capacity measures to trade growth. The authors do a commendable job of controlling for endogeneity arising from home market growth. But consider the measure of internal trade costs, which is the percentage of the population near rivers and coasts. This measure places a heavy weight on water transport, which is questionable in light of effective road and railroad infrastructure in many nations. As for endogeneity, surely the decisions of people to locate near the coast are dependent on export growth, as the case of China exemplifies. Thus, I am not sure that this measure really is a primitive of the model.

Sixth, I like the idea of attributing supply-capacity growth to underlying determinants. However, it is hard to see how the governance measure, an index of property rights protection, actually captures rising costs as the economy specializes in export goods. The theory refers to rising marginal costs as the economy concentrates its resources in exports, which is a natural way of capturing general-equilibrium resource constraints. However, the limiting impacts of weak property rights surely operate at any level of commodity mix or unemployment and there seems little relationship to its claimed use in the paper.

A final comment, which is a bit inconsistent with the fourth point above, is to ask for more comments about the policy relevance of the results. What can we conclude about policy changes that we did not already know? Surely we want to raise FMA for poor countries, although one wonders how likely this is in the wake of the recent U.S. agricultural bill. We also want to cut internal trade barriers and improve governance that restrains trade. All of this makes sense at the aggregate level. But, to get more specific, can we conclude much from these results about specific institutional reforms to recommend? How might such reforms interrelate with barriers to trade in goods and services and to restraints on investment? I suppose I am asking for more thinking about what explains the residuals that emerge for many of the regional aggregates.

These comments are more in the nature of asking for better measures and more analysis than in criticizing the underlying model and approach. The paper provides interesting evidence on the sources of export growth for a large cross-section of countries, which in itself is a valuable exercise. The results for SSA in particular are compelling and convincing. Thus, I look forward to seeing more analysis using this model and additional perspective on the nature of institutional and geographical restraints on export growth.