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Latin America and Its New Trade Dependency . . .
This Time with China

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Abstract: This article examines the sources of economic growth for a group of Latin American countries in relation to their export performance in China. The analytical framework is based on an extended normalized quadratic profit function. The econometric results confirm that a favorable export record with China represents a positive source of growth for Latin America. However, it also creates long-run dependability conditions in terms of reduced prices and thinner profits that weaken its growth capacity. Latin American countries must seek product diversification away from their current commodity base and aggressively climb up the value chain to remain competitive worldwide.

Dependency theory, advanced separately by Singer and Prebisch in 1950, attempts to explain a recurring terms-of-trade variation that takes place when peripheral countries rely on low-value exports of primary goods to countries of the center and high-value imports of manufactured goods from those countries. Such a theory was rapidly challenged on political as well as economic grounds based on whether a deterioration or improvement of the terms of trade was indeed taking place. Regardless, it gave Latin America license to wall itself off behind protective barriers to lessen the persistence of cyclical shocks, while pursuing an allegedly superior strategy of self-reliant, long-term development (Blecker and Razmi 2009). The import substitution industrialization strategy required countries to isolate themselves to reshuffle their productive capacity toward diversified production of durable consumer goods. Nowadays, the region faces another kind of dependency as a growth-generating mechanism, but with respect to a completely unforeseen geographical and political actor.

Competition between China and Latin America is relatively modest compared to that between Asia and the United States. However, it is gradually gaining momentum. China exerts a sustained demand for Latin American goods that represents approximately 35 percent of its overall regional trade balance (López-Córdova, Micco, and Molina 2008). Such a large market share has become the leading factor driving world commodity prices to unprecedented levels and pushing Latin American economies forward. China and Latin America have mutually benefitted despite a striking pattern of comparative advantage reversal between an industrialized nation and developing countries (Arroba, Avendaño, and Estrada 2008; Lederman, Olarreaga, and Rubiano 2008). The former imports

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a wide range of low-end manufactured and tech goods while the latter shows an insatiable appetite for primary resources for its large domestic industry (Lall, Weiss, and Oikawa 2005). A plausible observation is that China is squeezing out Latin America from the world markets and jeopardizing its ability to develop technological innovations that will generate long-term growth (Gallagher and Porzecanski 2010). Efforts to expand Latin America's export share in China to nontraditional agricultural commodities or to carve out market niches for brand-name goods have also proved difficult as a result of perishable products with low-value content, substantial taste differences, and long travel distances to cover (Ellis 2009). However, the more worrisome aspect for Latin America, derived from an excessive export-oriented exposure, is its inability to conveniently decouple from China when needed.

Various streams of empirical research have studied the implications of asymmetric trade in the context of long-term economic growth in developed and developing countries. Easterly, Loayza, and Montiel (1997) model macroeconomic differentials among Latin American countries to endorse the importance of policy reforms in maintaining historical rates of economic growth. Akin and Kose (2008) disclose the more intensive nature of spillovers between developed and emerging economies using panel regressions. Their findings suggest that an increasing degree of diversification, high growth rates, and greater importance in the global economy have allowed countries like China to evolve into a multidimensional interdependence stage. Hanson and Robertson (2009) use a gravity trade model to conclude that the impact of China's economic growth on the demand for exports in manufacturing oriented Latin American countries is relatively modest. In contrast, Iacovone, Rauch, and Winters (2010) evaluate the effects of low wages and competitive pressures exerted by China on Mexican manufacturing firms at the product level. Their conclusion is that a rise in Chinese exports has forced them to shrink, exit, or alter existing production patterns regardless of their degree of sophistication, market orientation, and efficiency levels. Last, Bloom, Draca, and Van Reenen (2011) examine the role of Chinese import competition on patenting, research and development, and total factor productivity. Their results indicate that technical change has upgrading and positive effects on more innovatively advanced firms.

The contribution of these works to an understanding of the impact on selected economies triggered by the rapid expansion of foreign trade by China is unquestionable. However, none of them explicitly identifies or quantifies the underlying sources of growth for Latin American countries after their excessive reliance in exporting a narrow assortment of primary commodities to China. This article addresses those shortcomings. First, it empirically links the sustainability of their economic growth to factor endowments, technology, and the real exchange rate. Second, it considers the most salient trading partners such as Argentina, Brazil, Chile, Mexico, Peru, and Venezuela. These countries represent more than 90 percent of all trade with China and enjoy a strategic political position in terms of their regional influence. Third, it departs from the conventional body of ad hoc regression models or general equilibrium frameworks to measure trade effects on growth performance. Instead, it uses a quadratic profit function to estimate the

magnitude of the expansionary relationship between China and Latin America between 1984 and 2008. The analysis is structured in four sections. The first provides a snapshot of the trade dynamics between Latin America and China. The subsequent sections present the economic growth model being used, followed by a discussion of the data set and the empirical findings, and a presentation of some concluding remarks.

TRADE DYNAMICS BETWEEN LATIN AMERICA AND CHINA

Latin America underwent ambitious stabilization programs and structural reforms in the late 1980s and early 1990s. These macroeconomic policies and governance processes led to a 3.3 percent rate of economic growth, explained mainly by Latin America's external sector (International Monetary Fund 2009). Feenstra and Rose (2000) used a semiparametric methodology to rank both countries and commodities according to an exporting order consistent with the product-cycle hypothesis. However, Latin American countries did not experience such rapid convergence in terms of productivity levels and growth rates, and they ended up exporting just what they could. Over time, few of them diversified their exportable basket, and others were left with no other option than to respecialize in a handful of commodities despite the greater degree of openness, access to state-of-the-art technologies, and additional property rights they enjoy today (Hausmann and Rodrik 2003). The end results were substantial welfare implications associated with terms-of-trade-driven effects.

China started its political transition in 1978 through the acceleration of neoliberal reforms as part of a profound economic restructuring while still maintaining its communist-style rhetoric (Fernández and Hogenboom 2007). These reforms encouraged foreign investment in special economic zones along the coastal line where the state promoted industrial development through facilities, public services, and housing centers for workers, thereby converting China into the world's largest manufacturer (Rodrik 2006). A conveniently misaligned exchange rate coupled with tariff and quota reductions allowed it to increase its share of world trade. China currently produces approximately one-third of all manufactured goods in the world, accounting for nearly 10 percent of world exports and 12.5 percent of world imports. Recently, it became the largest trading nation after Germany and the United States (Li and Wang 2009).

The inclusion of China in the World Trade Organization in 2001 further remapped the entire trade and foreign direct investment scenarios (Abreu 2005). Liberalization policies contained in its accession protocol added certain vulnerability to external factors accompanied by greater domestic market competitiveness. Nevertheless, China still managed an impressive and consistent annual growth rate of almost 10 percent in the past three decades.

Lederman, Olarreaga, and Soloaga (2007) suggest that such a remarkable economic and industrialization resurgence presents more challenges than opportunities to China's Latin American trading partners. In fact, Jenkins, Dussel Peters, and Moreira (2008) emphasize the incapacity of the region to alleviate poverty through cheaper prices for consumers or to increase government spending on

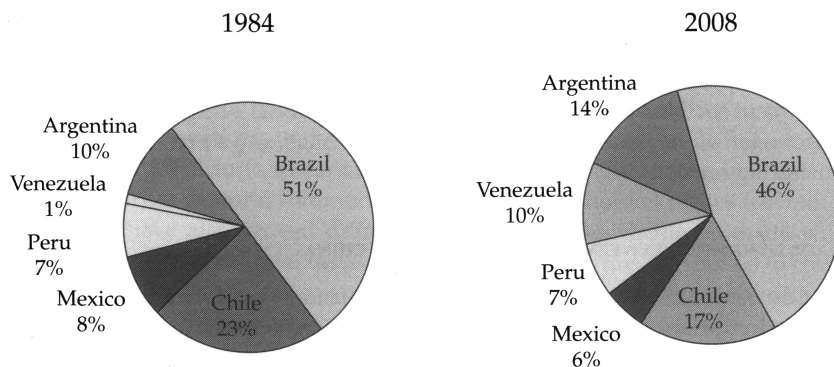


Figure 1 Shares of Export Values to China

Source: Calculated from the International Monetary Fund and the National Bureau of Statistics of China's Customs Statistics Database.

social causes as a result of Latin America's widespread export surge of labor-intensive agricultural products. In contrast, Gottschalk and Prates (2006) pinpoint Latin America's lack of vision for keeping up with a reasonable investment rate, especially in infrastructure, in virtue of ongoing upward price trends associated with a heavy concentration on mineral resources.

Figure 1 presents a snapshot of the export value shares to China by country in 1984 and 2008. Initially, Brazil and Chile dominate the chart with a whopping 74 percent of the total exports, mainly of oilseeds, sugar, meat, copper, fruits, and cellulose. Mexico and Peru maintain export value shares close to 8 percent each, with products such as integrated circuits, iron ore, gold, and fish flour. In 2008, all countries consolidate their market position by reaffirming their export status of low-value-added commodities. In turn, Argentina and Venezuela increase their relative participation in export values through soy and oil to gradually level them out at the expense of Brazil.

Figure 2 highlights the import value shares from China by country in 1984 and 2008. It starts with Brazil being, essentially, the primary importer of traditional textiles, clothing, and footwear, leaving other countries with marginal participation. After twenty-five years, the importing landscape changes dramatically when China prioritizes its mass-scale production and internal value-added generation by expanding from traditional textiles, clothing, and footwear. It still maintains Brazil as the leading importer, yet it allows Argentina, Chile, and Mexico to gain greater import value shares, ranging from 10 percent to 28 percent, for chemical products, mechanical equipment, and electronic components.

Figure 3 presents a longitudinal view of the exports from each Latin American country to China in US dollars from 1984 to 2008. The exponential type of trend that picks up around 2000 is obvious for every single country, despite the fact that each one had established diplomatic relations with China in the early 1970s. Latin American exports to China grew at an annual average rate of 19.9 percent in

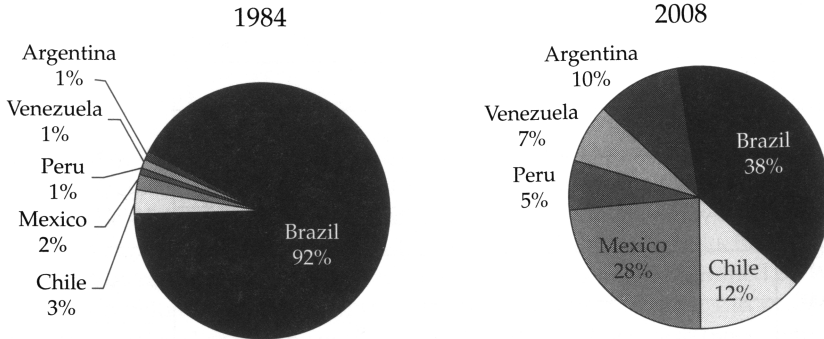


Figure 2 Shares of Import Values from China

Source: Calculated from the International Monetary Fund and the National Bureau of Statistics of China's Customs Statistics Database.

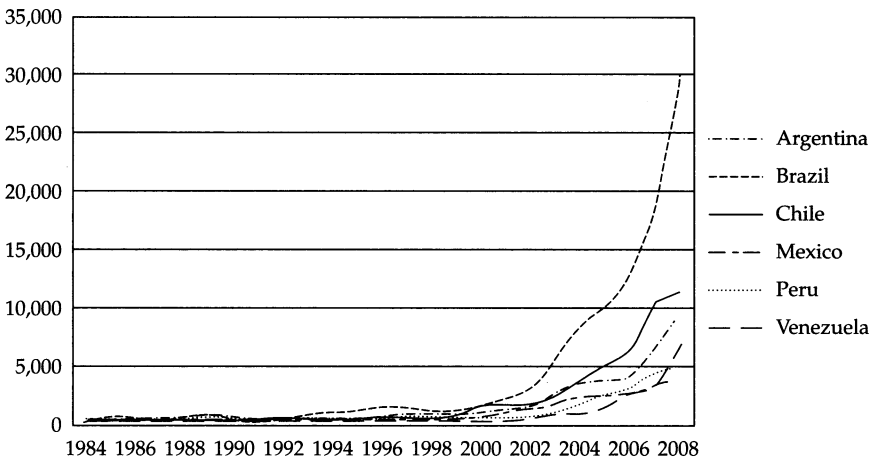


Figure 3 Export Values to China (Million USD)

Source: Calculated from the International Monetary Fund and the National Bureau of Statistics of China's Customs Statistics Database.

that period, which was 2.2 percent slower than its import growth. The signing of country-specific free-trade agreements explains the favorable commercial increase in the following years. Brazil and Chile are the biggest exporters, leaving Argentina at midpoint with respect to the remaining countries. Greater competitiveness and increased demand have allowed these countries to expand their market share at the expense of a redirection from other export markets.

Figure 4 shows the imports from China to the six Latin American countries in US dollars from 1984 to 2008, rising at an average rate of 22.1 percent per year. The analysis shows a sharp import increase when the globalization wave began

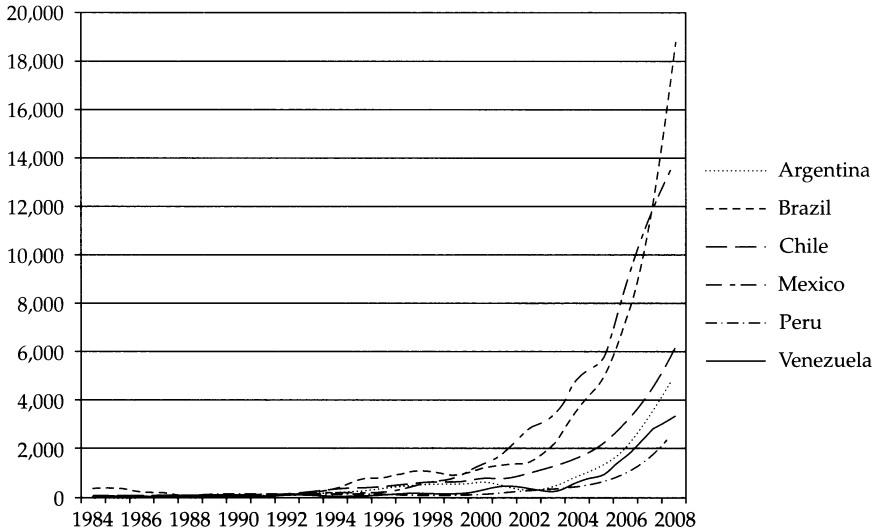


Figure 4 *Import Values from China (Million USD)*

Source: Calculated from the International Monetary Fund and the National Bureau of Statistics of China's Customs Statistics Database.

to pick up in the late 1990s. Brazil is the most dominant importer. Mexico follows suit as the second-biggest importer, with an unbalanced relation that explains its growing trade deficit. Chile is at midpoint with respect to the other countries. The buoyant importing flow will likely reach a plateau given the limited purchasing power among Latin American countries and the fact that China can reorient its multilateral trade with aims other than commercial ones. Overall, Latin America still maintains a trade surplus with China mainly as a result of increased commodity prices.

ANALYTICAL FRAMEWORK

The following two-sector economic model formally assumes the optimality of resource allocation as a source of growth. It uses the nontradable sector *NT* that produces intermediate and final goods and services for the domestic market and the tradable sector *X* that produces exportable goods and services. As López (1991) has shown, sectoral output is a function of capital and labor allocated to each sector as well as technology. Furthermore, output in the nontradable sector depends on the export volume to represent the spillover effects that encourage investment and rationalize production throughout the economy.

$$Q = Q_{NT}((K_{NT}, L_{NT}, Q_X) + Q_X(K_X + L_X), T). \quad (1)$$

A multiproduct profit function model under competitive equilibrium and profit maximization conditions is defined as in (2), where the vector of expected output

and input prices P^e breaks down into nontradables P_{NT} , importables P_M , imported intermediate inputs P_{MI} , and exportables P_X :

$$\pi^e = \pi^e(P^e; Q, K, L, T). \tag{2}$$

Analogously, the vector of output and input quantities Q breaks down into nontradables Q_{NT} , importables Q_M , imported intermediate inputs Q_{MI} , and exportables Q_X . The vectors of capital stock, employment, and a technology index are denoted as K, L , and T , respectively. Subsequently, the set of fixed production factors is generically represented as Z , and the set of exogenous ones is signified by W .

The well-behaved profit function (2) is homogeneous of degree 1 in prices to allow for its normalization in any chosen real price unit P^e . It is also twice continuously differentiable, convex, and linearly homogeneous in capital and labor under constant returns to scale to be expressed in ratio terms. A profit-maximizing equilibrium level at market prices P^e is obtained by the partial derivatives of π^e with respect to expected output and input prices ($P_i; i = 1, \dots, n$):

$$Q^e = \frac{\partial \Pi^e}{\partial P_i^e} = Q_i^*(P^e; Z, W), \tag{3}$$

where $1, \dots, n$.

The specification of (3) as an extended multiproduct normalized quadratic profit function allows for the empirical estimation of local second-order approximations to an arbitrary class of flexible functional forms. The risks of imposing restrictive assumptions with respect to homotheticity and separability between factor proportions and output rate have been acknowledged extensively (Lau 1976; López 1985; Diewert and Wales 1987). However, the advantages of the extended multiproduct normalized quadratic profit function of attaining global convexity if it is locally convex are twofold: first, it yields simple linear supply and demand functions of relative prices that have real quantities or their indexes as dependent variables; second, it facilitates the evaluation of elasticities at sample mean values of prices and quantities. Following Diewert (1974), the extended multiproduct normalized quadratic profit function results in (4):

$$\begin{aligned} \Pi = & \alpha_0 + \sum_i \beta_i P_i + \sum_j \gamma_j Z_j + \sum_k \delta_k W_k + \frac{1}{2} [\sum_i \sum_i \varepsilon_{ii} P_i P_i + \sum_j \sum_j \varepsilon_{jj} Z_j Z_j + \sum_k \sum_k \zeta_{kk} W_k W_k] \\ & + \sum_i \sum_j \eta_{ij} P_i Z_j + \sum_i \sum_k \theta_{ik} P_i W_k + \sum_j \sum_k \vartheta_{jk} Z_j W_k \end{aligned} \tag{4}$$

where $\pi = \pi^e / P_0^e$; $P_i = P_i^e / P_0^e$; $\alpha, \beta, \gamma, \delta, \varepsilon, \zeta, \eta, \theta$, and ν for all $\forall i, j, k$, are unknown parameters. Application of Hotelling's lemma allows the first derivatives of (4) with respect to output and input prices to specify the output-supply and input-demand equations. Thus, such a system of linear equations is analytically derivable and generically represented in positive terms to represent an output-supply equation and in negative terms to represent an input-demand equation as follows:

$$\frac{+}{-} Q_i = \frac{\partial \pi}{\partial P_i} = \beta_i + \sum_i \varepsilon_{ii} P_i + \sum_j \eta_{ij} Z_j + \sum_k \theta_{ik} W_k + \mu_i. \tag{5}$$

The vectors of fixed and exogenous factors have η and θ as their unknown parameters. Symmetry conditions imposed across equations (4) and (5) reduce the number of estimated parameters and offer sufficient degrees of freedom for their analytical derivation. It is further assumed that their error terms μ_i satisfy the seemingly unrelated conditions of being randomly independent and identically distributed. The system of equations shown in (5) is treated as a seemingly unrelated regression (SUR) equations model. Zellner's procedure allows for their iterative estimation once symmetry conditions and homogeneity restrictions are imposed. In contrast, equation (6) allows the obtaining of quantitative estimates of the output-supply and input-demand price elasticities for exportables, importables, imported intermediate inputs, and nontradables on the basis of the capital, labor, and technology availability for each country.

$$\begin{aligned} \Pi = & \beta_0 + \beta_{NT}P_{NT} + \beta_M P_M + \beta_{MI}P_{MI} + \beta_K K + \beta_L L + \beta_T T + \beta_{XRT} XRT + \beta_D DUM_{84/90} + \frac{1}{2} \beta_{NTNT} P_{NT}^2 \\ & + \frac{1}{2} \beta_{MM} P_M^2 + \frac{1}{2} \beta_{MIMI} P_{MI}^2 + \frac{1}{2} \beta_{KK} K^2 + \frac{1}{2} \beta_{LL} L^2 + \frac{1}{2} \beta_{TT} T^2 + \frac{1}{2} \beta_{XRTXRT} XRT^2 + \frac{1}{2} \beta_{DD} DUM_{84/90}^2 \\ & + \beta_{NTM} P_{NT} P_M + \beta_{NTMI} P_{NT} P_{MI} + \beta_{NTK} P_{NT} K + \beta_{NTL} P_{NT} L + \beta_{NTT} P_{NT} T + \beta_{NTXRT} P_{NT} XRT \\ & + \beta_{NTD} P_{NT} DUM_{84/90} + \beta_{MMI} P_M P_{MI} + \beta_{MK} P_M K + \beta_{ML} P_M L + \beta_{MT} P_M T + \beta_{MXRT} P_M XRT \\ & + \beta_{MD} P_M DUM_{84/90} + \beta_{KL} KL + \beta_{KT} KT + \beta_{KXRT} K XRT + \beta_{KD} K DUM_{84/90} + \beta_{LT} LT \\ & + \beta_{LXRT} L XRT + \beta_{LD} L DUM_{84/90} + \beta_{TXRT} T XRT + \beta_{TD} T DUM_{84/90} + \beta_{XRTD} XRT DUM_{84/90} \quad (6) \end{aligned}$$

EMPIRICAL ESTIMATION

This section presents the estimated results obtained from an extended multi-product normalized quadratic profit function from which the sources of growth are derived. It provides a comprehensive representation of the revenue structure of the various Latin American economies as a function of input and output prices, production factors, and other exogenous variables. Such a methodology has been widely used elsewhere to evaluate market responsiveness, spatial resource allocations, and aspects of trade efficiency.

The statistical information by country between 1984 and 2008 was obtained from various sources. The UN Commodity Trade Statistics Database, the International Monetary Fund's World Economic Outlook Database, and the central banks were the most useful.¹ Missing or extraneous figures were completed or refined with information coming from other national statistics agencies, including the National Bureau of Statistics of China's Customs Statistics Database.² The extended normalized quadratic profit function is individually estimated using annual data for each of the six Latin American countries.

Gross domestic product (GDP), deflated by each country's GDP deflator, is used as a proxy for π and was adjusted by population size to ameliorate potential

1. The International Monetary Fund's World Economic Outlook database is available at <http://www.imf.org/external/pubs/ft/weo/2009/02/weodata/index.aspx>.

2. The database is available at the website of the General Administration of Customs of the People's Republic of China, at <http://www1.customs.gov.cn/Default.aspx?tabid=2453&moremoduleid=3760&moretabid=4370>.

heteroskedasticity problems given the fact that a larger economy exports more than a smaller one. Prices for nontradables P_{NT} , importables P_M , and imported intermediate inputs P_{MI} were normalized by the price of exportables P_X and then proportionally broken down to create composite weighted average indices per country. Quantities for nontradables Q_{NT} , exportables Q_X , importables Q_M , and imported intermediate inputs Q_{MI} to and from China by country also correspond to weighted average indices of their domestic production and imported final and intermediate substitutes, respectively. These indices were measured as aggregate shares of their specific economic activities under the agriculture, manufacturing, or service sectors following the two-digit code section established by the UN Standard International Trade Classification. A much finer definition using group or subgroup structure levels was precluded given the diversity of factor endowments, intrinsic product heterogeneity, and the lack of reliable data on sectoral input intensities at the country level.

Capital K is represented as net fixed capital formation. It captures the flow value of all acquisitions made by households, businesses, and the government, less depreciation and obsolescence-driven disposal of the existing capital stock. The long-term market interest rate is considered its opportunity cost. Labor L is the official employment rate and its cost corresponds to a weighted average of the wages and salaries paid to unskilled and skilled workers, respectively. A time trend index T was included in the profit function to capture the degree of technological progress accrued by countries over time. Hence, it takes the value of 1 for 1984, 2 for 1985, and onward.

Measures of economic growth are misleading when a market exchange rate is used because of size variations, living standards, and productivity changes across nations. Exchange rates XRT expressed in purchasing-power parities take into account competitiveness distortions being created by price differences in traded and nontraded goods. Hence, the under- or overvaluation of each country's currency in relation to the Chinese yuan is explicitly included in the model. A dummy variable $DUM_{84/90}$ with the value of 1 from 1984 to 1990 and 0 otherwise is also included in the estimation set. This variable is used as a proxy for the costly recession that affected Latin America during that period. Those years are often regarded as the lost decade for the region because of their devastating and prolonged social and economic consequences.

The parameter estimates and their significance levels for each country-individual quadratic profit function presented in equation (6) are omitted because of space considerations.³ It suffices to say that the R^2 tests averaged 0.792 to reflect a good fit for each regression, whereas the F -tests showed statistically significant p -values that confirm the simultaneous nonnegativity influence of the explanatory variables on the dependent variable. The percentage of significant coefficients at the most conventional statistical levels fluctuated from sixty-five to seventy-five

3. Latin America is well known for its various amounts, degrees, and levels of corruption. A corruption perception index was added, considering that corruption unnecessarily increases transaction costs and slows market functioning. However, such an index did not yield a sufficient number of robust parameters across countries and was left out of the final iteration.

per country. The assumptions of downward-sloping input-demand functions and substitutability between capital and labor were both confirmed by their own-price effects. Every single parameter turned out significant but β_L in the case of Mexico. Cross-product parameters for which capital was involved with labor β_{KL} and the dummy variable β_{KD} were all significant across countries except for Argentina and Venezuela. The implications of these results are twofold: first, they reveal a gradual shift toward more capital-intensive industries; second, they confirm the labor-intensiveness the service sector is known for. Labor as a second-order term showed a mild, positive significance with the technology index β_{LT} for Brazil, Chile, and Mexico, and a higher positive one with Peru. It was also significant with the dummy variable β_{LD} for each country, thus reinforcing the deleterious unemployment consequences of the crises that affected the region. The dummy variable as it relates to technology β_{TD} was significant in all cases except in Peru and Venezuela.

Table 1 shows the elasticities and significance levels obtained from the estimated coefficients of the output-supply and input-demand functions for Latin America as a whole. These elasticities, evaluated at mean values, are based on the weighted average indices of all previous information and variables used in each country-individual profit function. Significance values for the initially missing

Table 1 Estimated Output-Supply and Input-Demand Elasticities for Latin America (Evaluated at Mean Values)

	Q_X	Q_M	Q_{MI}	Q_{NT}	D_K	D_L
P_X	0.47** (0.04)	-0.31 (0.34)	-0.18* (0.07)	0.25 (0.54)	0.21 (0.18)	0.30 (0.25)
P_M	-0.18 (0.32)	0.70* (0.10)	0.50 (0.16)	0.37 (0.43)	0.67 (0.24)	0.51 (0.46)
P_{MI}	-0.19* (0.09)	0.10* (0.08)	0.41 (0.15)	-0.22 (0.20)	0.29 (0.25)	0.16 (0.14)
P_{NT}	0.43 (0.50)	-0.14 (0.62)	-0.17 (0.29)	0.18** (0.02)	0.33 (0.37)	0.50 (0.40)
P_K	-0.44** (0.03)	-0.27 (0.12)	0.14 (0.70)	0.14 (0.14)	-0.32* (0.07)	-0.48* (0.09)
P_L	-0.78 (0.15)	-0.25 (0.39)	0.44 (0.17)	0.12 (0.52)	-0.45** (0.04)	-0.64 (0.11)
K	0.26* (0.10)	0.58 (0.19)	0.29 (0.22)	0.22* (0.08)	0.36** (0.05)	-0.15 (0.12)
L	0.18* (0.07)	0.75 (0.21)	0.12 (0.36)	0.60* (0.10)	-0.17 (0.14)	1.13 (0.12)
T	1.55* (0.08)	-1.43 (0.44)	1.07 (0.16)	1.04* (0.06)	1.39* (0.10)	1.45** (0.04)
XRT	0.21** (0.02)	0.36** (0.04)	0.25* (0.09)	0.09 (0.22)	0.07 (0.15)	0.64 (0.42)

Note: The figures in parentheses represent significance levels at 5 percent and 10 percent, denoted by * and **, respectively.

labor demand equation D_L were obtained after replacing it for the capital demand equation D_K into the SUR iteration.

The signs for the own-price elasticities are theoretically consistent throughout in terms of output response to price changes and factor utilization. They suggest upward-sloping output-supply and downward-sloping input-demand functions, which concur with the convexity properties of the profit function. These own-price elasticities are statistically significant at the 5 percent level, with the exception of importables, capital, and labor, which are marginally significant at values of less than 10 percent. Their magnitude indicates that they are all inelastic. Output-supply elasticities present values that fluctuate from 0.18 for nontradables to 0.70 for importables, whereas input-demand elasticities show values between -0.32 and -0.64 for capital and labor, respectively.

The expected production substitutability between the tradable and nontradable sectors was confirmed by their signs. However, p -values of 0.33 and 0.34 for exportables and importables render them not statistically significant. The estimated cross-price elasticities between capital and labor validate a substitutability condition that reinforces the input convexity of the profit function. Their prices negatively influence the demand for labor and capital, at least at the 10 percent level of statistical significance. The existing levels of capital and labor exert positive effects on the production of exportables and nontradables, with average estimated cross-price elasticities of 0.24 and 0.39, respectively. Both results confirm the various input intensities with which the production of exportables and nontradables takes place. Along these lines, López (1991) found that under a mildly distorted trade scenario, production of exportables is relatively more capital intensive than production of nontradables and final import substitutes, which are more labor intensive. Similarly, substitutability appears between capital and imported intermediate inputs in the production of nontradable inputs. Lederman, Olarreaga, and Rubiano (2008) further examined these factor intensities in their relation to the specialization pattern pursued by China to compete globally. Acknowledging some heterogeneity across regions, they concluded that Latin American countries exploit comparative advantages in sectors that are intensive in natural resources and scientific knowledge over comparative disadvantages in sectors in which skilled and unskilled labor are required.

Technology proxied by a time-trend productivity index T presents positive and significant elasticities associated with p -values less than 10 percent in the exportables and nontradables output-supply equations, and the capital and labor input-demand equations. Its impact is particularly large for exportables and labor. As expected, the effect of indigenous T on importables and intermediate importables is negative and nonsignificant given its specificity to domestic market conditions.

The role of competitive exchange rates XRT as a development tool to induce growth accelerations is positive and statistically significant. Exchange-rate elasticities with respect to exportables, importables, and intermediate importables are estimated to p -values of 0.02, 0.04, and 0.09 percent, respectively. The nontradable output-supply equation and the capital and labor input-demand equations present nonsignificant elasticities for the XRT variable.

Table 2 *Estimated Price Elasticities, by Country (Evaluated at Mean Values)*

	ϵ_{PX}	ϵ_{PM}	ϵ_{PMI}	ϵ_{PNT}
Argentina	0.48	0.39	0.16	0.14
Brazil	0.75	0.52	0.59	0.12
Chile	0.51	0.63	0.37	0.13
Mexico	0.39	0.85	0.53	0.15
Peru	0.35	0.99	0.47	0.16
Venezuela	0.32	1.05	0.45	0.17
Latin America	0.47	0.70	0.41	0.18

Table 2 presents the estimated price elasticities by country, evaluated at mean values from changes in the various prices. They all fall within conventional ranges. Price elasticities for exportables have a minimum value of 0.32 for Venezuela and a maximum of 0.75 for Brazil. As expected, importables show the more elastic prices, falling within a 0.39–1.05 spread for Argentina and Venezuela, respectively. Price elasticities for imported inputs have intermediate values that fluctuate between 0.16 for Argentina and 0.59 for Brazil. Price elasticities for nontradables are the most inelastic and vary from 0.12 for Brazil to 0.17 for Venezuela. These results correspond with those of Blecker and Razmi (2009) as relative prices of tradables move toward long-term purchasing power parity, especially for commodity exporting Latin American countries that face moderately high capital-labor ratios and relatively price-inelastic demands.

Table 3 decomposes the estimated sources of growth from price changes by country as well as a set of fixed production factors over the twenty-five-year period. The end points 1984 and 2008 offer a reasonably extended time to observe output fluctuations around their optimal long-term values. The average price responsiveness to exportables P_X of 0.57 confirms that Latin American economies are highly dependent on the growing market expansion of China. Such a very large contribution falls within a 0.47–0.68 range for Venezuela and Chile and reaffirms the need to consolidate a more sophisticated industry capable of adding value products of interest to China. As expected, price responsiveness to importables P_M is negative and averages -0.18 from a range of -0.26 to -0.12 for Chile and Mexico. Intermediate importables P_{MI} also have negative price responsiveness that average -0.09 , with -0.13 and -0.04 as extreme values for Brazil and Peru. Price responsiveness to nontradables P_{NT} is negative, with a -0.02 average from a range of -0.03 to -0.01 for Peru and Venezuela. The large spread of negative values for importables uncovers the foreign trade strategy pursued by China to penetrate markets using its sheer power instead of relying exclusively on country-specific free-trade liberalization agreements to lower the impact of antidumping measures on low-cost imports.

Price responsiveness to capital P_K averages -0.07 from a range of -0.10 to -0.05 for Mexico and Chile. Price responsiveness to labor P_L is negligible across

Table 3 Estimated Sources of Growth, by Country, 1984–2008 (Percentage Change)

	Argentina	Brazil	Chile	Mexico	Peru	Venezuela
P_X	0.62	0.56	0.68	0.56	0.57	0.47
P_M	-0.17	-0.15	-0.26	-0.12	-0.17	-0.20
P_{MI}	-0.08	-0.13	-0.07	-0.09	-0.04	-0.13
P_{NT}	-0.02	-0.02	-0.02	-0.01	-0.03	-0.01
P_K	-0.07	-0.06	-0.10	-0.05	-0.09	-0.07
P_L	-0.00	-0.00	-0.00	0.00	0.00	-0.01
K	0.50	0.53	0.46	0.47	0.52	0.67
L	0.22	0.17	0.20	0.18	0.29	0.26
T	0.28	0.35	0.38	0.37	0.16	0.14
XRT	0.18	0.23	0.08	0.09	0.15	0.23
$DUM_{84/90}$	-0.46	-0.40	-0.34	-0.38	-0.36	-0.36
Total	1.00	1.00	1.00	1.00	1.00	1.00

countries except for Venezuela, with a meager -0.01 percent. Capital K turns out to be the second most robust growth determinant for Latin America, after the price of exportables P_X , with a 0.52 average and Venezuela as its most relevant country. Labor L explains 0.23 of the growth in the region, with Brazil and Peru having extreme values of 0.17 and 0.29, respectively. Approximately, a 0.28-percentage-point growth in Latin America can be attributed to technical change T , with Chile, Mexico, and Brazil being the most notable, with values greater than 0.35. The exchange-rate stability XRT reflects its importance as a policy enhancing growth in open economies, explaining a 0.15 average growth from within the range 0.08–0.23 for Chile and Venezuela. The relatively low values obtained for Chile and Mexico seem counterintuitive, as these countries have deliberately maintained slightly appreciated real exchange rates resulting in higher and more prolonged output accelerations than others. The negative growth impact during the 1984–1990 subperiod captured by $DUM_{84/90}$ markedly offsets later effects and averages -0.38 , with a range of -0.34 to -0.46 for Chile and Argentina.

These findings are consistent with Cui, Shu, and Su (2009) and Guo and N'Diaye (2009), in that a 1 percent increase in China's GDP requires import expansion between 0.10 percent and 0.22 percent. Alternatively, if Latin America remained as dependent on its exports to China as it was between 1984 and 2008, 1 percent annual growth in Latin America's GDP would be sustained only if Latin America's export share to China increased by about 0.12 percent per year. A sensitivity analysis using a 10 percent variation in the various price-demand elasticities leaves the foregoing conclusions qualitatively unchanged. These results also emphasize that productivity-enhancing structural reforms play a role in explaining foreign demand as a source of economic growth. Differences in the types of cost reductions that increase efficiency in the use of production factors across Latin American countries hint at a qualitatively sound institutional

environment. Hence, policies that foster economic growth cannot neglect issues such as government effectiveness, macroeconomic stability, and human capital formation to attract foreign investment, promote competitiveness, and facilitate technical innovation.

CONCLUSIONS

The long-term economic sustainability of Latin America is at risk given its increasing export dependency on China. An overly pessimistic slowdown in China's domestic demand may not be a realistic scenario considering that past global financial crises barely scathed its growth rate at a time when developed countries floundered. Nevertheless, Latin America needs to rebalance its sources of economic growth by developing a set of export-led policy reforms that will lessen volatile commoditization. It has reached a point in its production possibilities frontier at which it is not feasible to further increase its level of output unless technology and innovation come into play. Latin America must broaden its productivity base, move into more sophisticated endeavors, and diversify its export basket to gain market share.

Exotic agricultural products may carry greater weight in future bilateral or multilateral trade relations with China. Economic rise and win-win regional trade agreements could also allow Latin American countries a condition of privileged collaborators. However, these strategic options may not create further trade and may instead, for example, generate tensions among interest groups. A new trade specialization pattern needs to unveil the shrinking trade balance and to position Latin America as a provider of manufactured products without its losing domination over traditional goods. This strategic relation would be strengthened if governments commit to diversifying their exporting model and promoting ways to empower traditional sectors, eliminating remnants of protectionism, and strengthening their initiatives in regional integration, as well as fostering open alliances between Latin American and Chinese enterprises in alternative industries and markets.

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