Trade, Specialization and Cycle Synchronization: Explaining Output Comovement between Latin America, China and India

César Calderón[*]

The World Bank, LCRCE

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Abstract

The main goal of the present paper is to explain whether trade and output specialization patterns may help explain the evolution of output co-movement of Latin American countries vis-à-vis China and India. Using a sample of 147 countries over the period 1965-2004 we update and extend the results in Calderon, Chong and Stein (2006) to show that higher trade intensity (specially more extensive intra-industry trade links) and more symmetric structures of production (as well as of exports and imports) may lead to more synchronous cycles. For the LAC region as a whole, the model predicts fairly well the changes in output comovement of LAC countries vis-à-vis China and India (more than 50 percent). However, the performance of the model across countries shows a wide variation.

Keywords: Business Cycle Synchronization, Intra-Industry Trade, Output Specialization
JEL Codes: E32, F15

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Introduction

In the last 2 decades, world trade has grown twice as fast as world output (6 vs. 3 percent), deepening economic integration (IMF, 2001, Kouparitsas, 2001). To the extent that countries are becoming more integrated into the world economy, their macroeconomic fluctuations have become increasingly affected by external disturbances —which includes output fluctuations in other economies. Shocks occurring in one country could be transmitted to another country through three basic channels: international trade in goods and services, international trade of financial assets, and direct linkages between sectors of production across countries. The role of international trade in transmitting business cycle fluctuations across countries has been widely recognized and analyzed (Canova and Dellas, 1993; Baxter, 1995). Trade linkages have proved to be quite important in the literature of optimum currency areas (OCAs), arguing that countries are more likely to benefit from a currency union if their have higher trade integration and more synchronized business cycles (Mundell, 1961; Frankel and Rose, 1998). Recent empirical research has found that country pairs with stronger international trade linkages tend to have more highly correlated business cycles not only among industrial countries (Clark and van Wincoop, 2001; Rose and Engel, 2001) but also among developing countries although at a weaker degree (Calderon, Chong and Stein, 2006).

On the other hand, China and India's faster growth and deeper integration into the world economy may be affecting the business cycle of other economies. In our case, we are concerned whether developments in China and India may be affecting output prospects in Latin America (LAC). Rising correlations for LAC countries vis-à-vis China and India (Figure 1) have its counterpart in the increasing demand for some of LAC's commodities (Figure 2) and a sharp increase in bilateral trade between LAC, China and India (Figure 3). The largest LAC economies have increased their share of trade with China in total trade from less than 2% in the 1980s to 6% in 2000-4, with Chile and Peru having a trade share with China higher than 10% of total trade in the 2000s. On the other hand, trade between LAC and India has also increased although this growth has been modest compared to trade with China. The largest LAC economies have raised their trade share with India from 0.44 to 0.73 percent of their total trade.

Our main goal is to analyze whether higher trade integration between the LAC region and China and India is driving higher output correlations among them. According to the literature, the impact of trade integration on business cycle correlation could go either way (Frankel and Rose, 1998): First, trade integration may increase output correlation if the demand channel is the dominant force driving business cycles. For instance, positive output shocks in a country might increase its demand for foreign goods, and the impact on the output of the country's trading partner will depend on the depth of their trade linkages. Second, if industry-specific shocks are the dominant force explaining cyclical output, the relationship would be negative if increasing specialization in production leads to inter-industry trade (as usually observed in developing countries). In this case, trade integration leads to specialization in different industries, which in turn leads to asymmetric effects of industry-specific shocks. Finally, if intra-industry trade prevails (as observed in industrial countries), specialization does not necessarily lead to asymmetric effects of industry-specific shocks, since the pattern of specialization occurs mainly within industries.

Using a sample of 147 countries (23 industrial economies and 124 developing countries) with annual information for the period 1965-2004, we update and extend the results in Calderón, Chong and Stein (2006) for the sample of LAC countries vis-à-vis the Rest of the World. After performing our regression analysis, we find that:

- Countries with more extensive trade links display higher output co-movement. We find evidence that a higher degree of intra-industry trade among country pairs may generate a higher degree of business cycle synchronization.
- Output specialization —as proxied by the degree of asymmetry in the structure of production among countries— may lead more asynchronous business cycles. The same result holds for asymmetries in export and import baskets —although we fail to find a significant effect for asymmetries in structure of imports.
- Output specialization —as well as specialization in exports and imports— may reduce the sensitivity of cycle synchronization to changes in bilateral trade. That is, the impact of trade intensity on output co-movement is higher for countries with more symmetric structures of production and trade.

Using the results of our regression analysis, we evaluate how good is our model in tracking the changes in output comovement for the LAC region as well as selected LAC countries vis-à-vis China and India in 1995-2004 relative to 1985-94. We find that:

- On average, our model does a fairly decent job predicting changes in output correlation for the region vis-à-vis China and India. However, the country-by-country analysis shows wide heterogeneity in terms of performance.

- For the LAC region as a whole, our model explains 54 percent of the actual change in output correlation with China and the predicted change is mostly attributed to demand spillovers (65%), while bilateral trade and asymmetries in production structures explain the remaining 35%.
- In the case of output comovement with India, demand spillovers explain most of the increase in predicted correlation (70%), with the remaining 30% attributed to trade integration and output specialization.
- As we said before, the performance of the model to track changes in output correlation of LAC countries vis-à-vis China and India varies significantly. However, the performance of our model tracking changes in correlation seems to fit better the evolution of the correlation with China rather than India.

The rest of the paper is organized as follows. Section 2 provides some theoretical insights regarding the relationship between trade integration and the synchronization of business cycles. Section 3 discusses the data and presents the econometric methodology used in our empirical evaluation. Section 4 discusses the main results of our regression analysis. Section 5 uses our regression results to explain changes in output correlation for Latin American countries vis-à-vis China and India. Finally, Section 6 concludes.

II. Some Theoretical Insights

In the present section we present a simple theoretical framework to understand the different channels through which trade intensity may affect the degree of synchronization of business cycles. We first define the cyclical component of real output $\tilde{y}_{it} = y_{it} - \bar{y}_{it}$ as the deviation of (the log of) real output from its trend component, $\bar{y}_{it}$. Following Stockman (1988), we can argue that the cyclical component of real output in country *i* at time *t*, $\tilde{y}_{it}$, can be decomposed as the weighted average of the cyclical components of all the *k* sectors in the economy $\tilde{y}_{kit}$ (where $k=1,...,n$), with weights s_{ki} being approximated by the share of sector *k*'s output in total output ($\Sigma_k s_{ki} = 1$),

$$\tilde{y}_{it} = \sum_k s_{ki} \tilde{y}_{kit} \tag{1}$$

Next we can express the cyclical component of real output in sector *k* at time *t* as deviations from the country's average fluctuation across sectors at time *t*, $\tilde{y}_{\cdot it}$, we can rewrite (1):

$$\tilde{y}_{it} = \sum_{k} s_{ki}\eta_{kit} + \zeta_{it} \tag{2}$$

where the cyclical component of real output for country *i* at time *t* consists of the weighted average of *k* sectoral output shocks at time *t*, $\eta_{it} = \tilde{y}_{kit} - \tilde{y}_{\cdot it}$, and the aggregate shock to output of country *i* at time *t*, ζ_{it} Analogously, we can define the cyclical component of real output for the foreign country —that is, country *j*— as

$$\tilde{y}_{jt} = \sum_{k} s^{*}_{kj}\eta_{kjt} + \zeta_{jt} \tag{2*}$$

Assumptions (Stockman, 1988):

(1) $\{\eta_{kit}\}$ is distributed independently of each other across both *k* sectors and time *t*, with sectoral variance σ_k^2;

(2) Industry shocks are similar across countries, $\eta_{kit} = \eta_{kjt}$, and have the same variance σ_k^2;

(3) $\{\zeta_{it}\}$ is distributed independently over time;

(4) $\{\eta_{kit}\}$ and $\{\zeta_{it}\}$ are independent from each other.

Using assumptions (1) through (4) we can compute the covariance between the cyclical component of real output in countries *i* and *j* as follows,

$$\sigma(\tilde{y}_i, \tilde{y}_j) = \sigma_k^2 \sum_{K} s_{Ki} s_{Kj} + \sigma(\zeta_i, \zeta_j) \tag{3}$$

where σ_k^2 is the variance of real output in sector *k*, and $\sigma(\zeta_i, \zeta_j)$ is the covariance between country-specific aggregate shocks.

Theoretically, the impact of rising trade integration on business cycle synchronization is ambiguous. Assuming that business cycles are dominated by *industry-specific shocks*, η_{kit}, the Heckscher-Ohlin paradigm predicts that rising trade integration between countries *i* and *j* may lead to deeper specialization in both countries and to declining output correlation between countries *i* and *j*. Given that sectoral variance is always positive, *i.e.* $\sigma_k^2 > 0$, rising trade will lead to a negative co-movement between s_{ki} and s_{kj} (due to specialization in production) and, ceteris paribus, to declining output correlation between countries *i* and *j*. Recent research has found another mechanism that will yield a negative association between trade integration and business cycle synchronization (Kalemli-Ozcan, Sorensen and Yosha, 2001): higher integration in both international goods and financial markets would allow countries to insure against asymmetric shocks through diversification of ownership and can afford to have a specialized production structure. Hence, enhanced opportunities for income diversification induce higher specialization in production and more asymmetric business cycles.

On the other hand, if patterns of specialization in production and international trade are dominated by *intra-industry trade*, deeper trade links will not necessarily result in deeper specialization along industry lines as predicted by the Heckscher-Ohlin paradigm. In this case, industry-specific shocks, η_{kit}, will not necessarily affect different countries more asymmetrically as they become more integrated (Krugman, 1993). Here, deeper trade integration does not necessarily lead to a negative correlation between s_{ki} and s_{kj}. Hummels, Ishii and Yi (2001) find that countries are increasingly specializing in particular stages of a good's production sequence rather than producing the entire good (*i.e.* vertical specialization).[1] In addition, Kose and Yi (2001) have argued that a rising trend in this *"back-and-forth"* trade might lead to a greater response of the business cycle correlations to higher trade integration.

Finally, higher trade integration may have an impact on the *correlation between country-specific aggregate shocks,* $\rho(\zeta_i, \zeta_j)$ through different channels: (1) *Spillover effects* from aggregate demand shocks. Favorable income shocks in one country might lead to higher demand for both foreign and domestic goods. The effect on $\rho(\zeta_i, \zeta_j)$ might be stronger if trade integration leads to coordinated policy shocks (Frankel and Rose, 1998).[2] (2) Rising trade integration might lead to a more rapid spread of productivity shocks through a more rapid diffusion of knowledge and technology (Coe and Helpman, 1995) or via inward FDI and technology sourcing (Lichtenberg *et al.* 1998).

In sum, the relationship between trade integration and business cycle correlation is *theoretically ambiguous*. While the impact is positive if country-specific aggregate shocks dominate business cycles, the effect of trade integration is not clear if industry-specific shocks are the main source of business cycle. In the latter case, the nature of the relationship between trade integration and cyclical output correlations depend on the patterns of specialization in production once the economy is open to international markets.

III. Data and Methodology

[1] Yi (2001) shows that models of international trade with vertical specialization can explain about 70 percent of growth in world trade.

[2] In the presence of fiscal consolidation or more coordinated monetary policies, the impact of spillovers from aggregate demand is even larger.

3.1 The Data

Our dependent variable is the *degree of business cycle synchronization between* countries *i* and *j* at period τ (of length *T*). To measure this variable, we compute the correlation between the cyclical components of output for countries *i* and *j*,

$$\rho(\tilde{y}_i, \tilde{y}_j)_\tau = \frac{\text{cov}(\tilde{y}_i, \tilde{y}_j)_\tau}{\sqrt{\text{var}(\tilde{y}_i) \cdot \text{var}(\tilde{y}_j)}} \tag{4}$$

where $\tilde{y}_{it}$ is the cyclical component of real output (*y*) in country *i* and time *t*. Our measure of real output is the real GDP in local currency at constant prices (in logs), taken from the World Bank's World Development Indicators. The cyclical component of output in country *i* at time *t*, $\tilde{y}_{it}$, is obtained using the *band-pass filter* proposed by Baxter and King (1999). Unlike other trend-cycle decomposition techniques, this filter takes into account the statistical features of the business cycle.[3] In accordance with these statistical properties, Baxter and King showed that the desired filter is a *band-pass filter*, that is, a filter that passes through components of the time series with periodic fluctuations between 6 and 32 quarters, while removing components at higher and lower frequencies.[4] Specifically, we compute the cyclical component of real output by applying the band-pass filter on the series over the period 1960-2004. Once the business cycle is computed for each country, we calculate the correlation between de-trended output in countries *i* and *j* over the following non-overlapping 10-year periods: 1965-1974, 1975-1984, 1985-1994, and 1995-2004. According to this measure, higher output correlation between countries *i* and *j* implies a higher degree of business cycle synchronization.

The *bilateral intensity of international trade* between countries *i* and *j* in period τ (of length *T*) is approximated with the following measures:

$$T^F_{i,j,\tau} = \ln\left(\frac{1}{T}\sum_t \frac{1+f_{i,j,t}}{F_{i,t}+F_{j,t}}\right) \text{ and } T^Y_{i,j,\tau} = \ln\left(\frac{1}{T}\sum_t \frac{1+f_{i,j,t}}{Y_{i,t}+Y_{j,t}}\right) \tag{5}$$

[3] The NBER chronology lists 30 complete cycles since 1858. The shortest full cycle (peak to peak) was 6 quarters, and the longest 39 quarters, with 90 percent of these cycles being no longer than 32 quarters (Stock and Watson, 1999).

[4] Baxter and King (1999) argue that the ideal band-pass filter is a moving average process with infinite order. Due to practical reasons, we must approximate this filter with finite moving averages. They specifically recommend the use of a 7-year centered moving average when working with both quarterly and annual time series data. Finally, note that although we used the band-pass filter as our preferred de-trending technique, the results that we will present in sections 4 and 5 are robust to any of the four trend-cycle decomposition techniques used in this paper.

where $f_{i,j,t}$ denotes the amount of bilateral trade flows (exports and imports) between countries *i* and *j*, while F_{kt} represents total (multilateral) trade —exports and imports— of country *k* (with $k=i,j$) in period *t*. Note that the numerator of the explanatory variables is $(1+f_{i,j,\tau})$ in order to deal with the observations with *zero trade flows*, which would otherwise be dropped by taking logs. This is not a problem in studies which focus on industrial countries, since in that case bilateral trade flows are non-zero. In our case, approximately 23-25 percent of the observations in our panel data set which includes 147 countries have zero trade flows. In order to prevent the loss of these observations, which may contain important information, we add one to the bilateral trade flows, which is one of the standard ways to deal with this problem in the context of gravity models of bilateral trade.[5] Equation (5) computes $T^{F}_{i,j,\tau}$ as the ratio of bilateral trade flows between countries *i* and *j* divided by the sum total trade flows (exports and imports) of countries *i* and *j*, and $T^{Y}_{i,j,\tau}$ as the ratio of bilateral trade flows between countries i and j to output in both countries ($Y_{i,t}$ and $Y_{j,t}$, respectively).[6]

The bilateral trade data are taken from the International Monetary Fund's Direction of Trade Statistics, whereas nominal and real GDP data are taken from the World Bank's World Development Indicators. We gather annual data for the 1965-2004 period on bilateral trade flows for the 147 countries in our sample (see appendix I for our list of countries), and we use only imports CIF data in order to construct the measures specified in equation (5).[7] Following Feenstra (2005) we prefer to use the importers' reports whenever they are available, given that these are more accurate than reports by the exporter.[8] Next, we compute averages over the annual data for the non-overlapping 10-year periods spanning 1965-2004. Our discussion of the results will

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[5] See, for example, Eichengreen and Irwin (1998). We should note, however, that dropping the zero observations (i.e., not adding unity to the bilateral trade flow) does not change the results in any significant way.

[6] In addition to these two measures of trade intensity, we also used a theoretical measure of bilateral trade intensity derived by Deardorff (1998), in which the bilateral trade is divided by the product of the GDPs, and multiplied by the world GDP. For reasons of space, we have not included these results in the present version. They are qualitatively similar to the results using our other measures, and are available upon request.

[7] Although there was data for imports FOB on the IMF's Direction of Trade Statistics, the data availability was more limited. That is, it represents at most 20 percent of the coverage with imports CIF.

[8] A problem which is typical of bilateral trade data is export flows from country i to country j are not necessarily equal to import flows of country j from country i.

mainly focus on the bilateral trade figures normalized by output since it captures with more accuracy the effective degree of integration between two countries.[9]

We also evaluate the impact of *intra-industry trade intensity* on business cycle synchronization. To accomplish this task, we constructed the Grubel-Lloyd (1975) measure of intra-industry trade between countries i and j, $GLI_{i,j}$:

$$GLI_{i,j} = 1 - \frac{\sum_k \left| x_{i,j}^k - m_{i,j}^k \right|}{\sum_k \left(x_{i,j}^k + m_{i,j}^k \right)} \tag{6}$$

where $x_{i,j}^k$ and $m_{i,j}^k$ are exports from country i to country j and imports from country i to country j, respectively, and k represents an index over industries. Our measure of intra-industry trade between countries i and j, $GLI_{i,j}$, represents the proportion of intra-industry trade in the total trade of these two countries. Our data on intra-industry trade has been obtained from the NBER-U.N. World Trade data as collected by Feenstra (2005). We use here the SITC (Rev. 2) two-digit level bilateral exports and imports between countries i and j. We have annual data on bilateral trade across industries for the period 1962-2000 and we compute the corresponding 10-year period averages over this annual dataset. For a more detailed description of the data, see Feenstra (2005).

Another possible determinant of business cycle correlation is the extent of the similarities or differences between the structures of production or trade among countries. We first consider a measure of the *similarities in the structure of production*. Evidence shows that industry-specific shocks will generate higher degree of business cycle synchronization among regions with similar production structures rather than among regions with asymmetric structures (Imbs, 2001; Loayza, López, and Ubide, 1999; Kalemli-Ozcan et al. 2001; Imbs, 2003). This variable is approximated using the absolute value index suggested by Krugman (1991). Letting $s_{k,i}$ and $s_{k,j}$ denote the GDP shares for industry k in countries i and j ($k=1,2,...,N$ industries), we compute an index of asymmetries in structures of production (or industry specialization) as

$$ASP_{i,j,\tau} = \frac{1}{T} \sum_t \sum_{k=1}^{N} \left| s_{ki} - s_{kj} \right| \tag{7}$$

[9] For example, the share of bilateral trade to total trade between countries i and j could be very high (say, for a pair of remote countries). However, both could have a small external sector and, therefore, the share of bilateral trade to their outputs could be very small.

where $ASP_{i,j,\tau}$ is the index of asymmetries in structures of production between countries *i* and *j* averaged over period τ (of length *T*). The higher the value of $ASP_{i,j,\tau}$, the greater the difference in industry shares between countries *i* and *j* and, therefore, the greater the differences in structures or production.[10] Given that industry specialization may affect business cycle synchronization through different mechanisms, we measure specialization using the 9-sector classification from the 1-digit level ISIC code.[11] Data for the construction of these indices was obtained from the World Bank's World Development Indicators and UNIDO. Finally, we also construct the index of *asymmetries in the structures of exports* between countries *i* and *j* over period τ, $ASX_{i,j,\tau}$, using the export shares for industry *k* in countries *i* and *j* at the two-digit level SITC categories. Again, the higher the values of $ASX_{i,j,\tau}$, the greater the differences in export structures between countries *i* and *j*. Analogously, we construct the index of *asymmetries in the structures of imports* between countries *i* and *j* over period τ, $ASM_{i,j,\tau}$.

3.2 Empirical Strategy

We have collected annual data for 147 countries over the period 1965-2004 on both real GDP and bilateral trade and we analyze a panel data sample where we split our 40 years of data into four equally sized parts: 1965-1974, 1975-1984, 1985-1994, and 1995-2004.

In order to test the impact of trade integration (approximated by coefficients of bilateral trade intensity) on business cycle synchronization (measured by the correlation between cyclical outputs), we run the following *baseline regression* using our panel data:[12]

$$\rho(\tilde{y}_i, \tilde{y}_j)_\tau = \alpha_{i,j} + \beta_\tau + \gamma T^K_{i,j,\tau} + \phi GLI_{i,j,\tau} + \delta ASP_{i,j,\tau} + u_{i,j,\tau} \quad (8)$$

where $\rho(\tilde{y}_i, \tilde{y}_j)$ denotes the business cycle correlation between countries *i* and *j* over time period τ (of length *T*=10 years), $T^K_{i,j,\tau}$ is the average bilateral trade intensity between countries *i*

[10] Although there is no standard measure of industry specialization in the literature, the index specified in equation (8) is used by Krugman (1991), Clark and van Wincoop (2001) and Imbs (2003). On the other hand, Imbs (2001) uses the correlation between sectoral shares in total output and employment.

[11] Our index comprises the following 1-digit level ISIC code activities: (i) Agriculture, Hunting, Forestry, and Fishing; (ii) Mining and Quarrying; (iii) Manufacturing; (iv) Electricity, Gas, and Water; (v) Construction; (vi) Wholesale and Retail Trade; (vii) Transport, Storage and Communication; (viii) Finance, Insurance, Real Estate, and Business Services, (ix) Community, Social, and Personal Services.

[12] We address the issue of non-normality of the error process due to the censored dependent variable by applying a logistic transformation to the output correlation, $\tilde{\rho} = \ln\left(\frac{1+\rho}{1-\rho}\right)$. The results remain qualitatively invariant.

and j over time period τ, either normalized by trade ($K=F$) or output ($K=Y$), $GLI_{i,j,\tau}$ is the Grubel-Lloyd Index of intra-industry trade and $ASP_{i,j,\tau}$ is the measure of industry specialization. In addition, $\alpha_{i,j}$ represent country-pair specific effects, while β_τ are time-effects which are proxied by decade dummies. Note that we also run other specifications where we include the asymmetries in the structure of exports or imports instead of the asymmetries in structures of production.

The inclusion of country-pair fixed effects allows us to control for all the time-invariant, country-pair specific variables which may have an impact on output correlation.[13] More importantly, including the country pair fixed effects leads us to focus on the time-series dimension and, thus, on the right policy question. We want to know what happens to the output correlation in Latin America vis-à-vis China and India when bilateral trade intensity among them increases. This is not exactly the same as asking whether country pairs with higher bilateral trade intensity have higher output correlation than other country pairs, which is the question answered by the cross section regressions. As Glick and Rose (2002) have argued convincingly in their analysis of the impact of monetary unions on trade, the former —and not the latter— is the right policy question.[14]

Our main interest lies on the sign and the magnitude of the slope coefficient γ. If industry shocks are the dominant source of business cycles and openness to trade leads to complete specialization (as Heckscher-Ohlin would predict), we would expect γ to be negative. On the other hand, if openness to trade leads to vertical specialization (and, therefore, more intra-industry trade), or if global shocks dominate economic fluctuations then we would expect γ to be positive.

A problem with equation (8) is that, as discussed earlier, trade intensity itself may be endogenous. Higher output correlation could encourage countries to become members of a currency union, which in turn could lead to increased trade intensity (Frankel and Rose, 1998, 2002; Rose and Engel, 2002). Alternatively, both of our variables of interest, namely output correlation and trade intensity, could be explained by a third one, such as currency union, which at the same time reduces transactions costs in trade flows, and links the macroeconomic policies of their members.

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[13] For example, a pair of countries may be very proximate and subject to common natural disasters such as hurricanes or floods. Alternatively, both countries in the pair may have a very high degree of trade intensity with the same third country, and through this channel their outputs may be highly correlated. These factors, as well as other omitted variables, will be captured by the country pair fixed effect.

[14] Our panel regressions include time dummies for the 1975-84, 1985-94 and 1995-04 periods, with the constant representing the period 1965-74 (*Base* category). Although the estimates for the time dummies are not reported, they are jointly significant in the majority of cases.

Hence, countries joining a currency union might exhibit a positive correlation between trade integration and business cycle synchronization. In this context, running an OLS regression for equation (9) would yield biased and inconsistent estimates of γ. Given the problems mentioned above, we need instruments for the bilateral trade intensity in order to estimate γ consistently. We use the gravity model of bilateral trade to motivate our choice of instrumental variables.

Following Wei (1996) and Deardorff (1998), we regress bilateral trade flows between country *i* and country *j*, $T_{i,j}^{K}$ —either normalized by trade (K=F) or output (K=Y)— on the following determinants: the (log of the) *distance* between countries *i* and *j* (d_{ij}), a dummy variable for countries sharing common border (B_{ij}), indicators of geographical remoteness for countries *i* and *j* that measures how far each country lies from alternative trading partners —REM_i and REM_j, respectively.[15] We also include a dummy for the presence of a free trade agreement in the country-pair (FTA_{ij}), the population density of countries *i* and *j*, dummy variables for countries sharing common language, colonial origin, main trading partner, geographic region, dummies for islands and landlocked countries, and legal origin.[16]

IV. Empirical Evaluation

4.1 Descriptive Statistics

In what follows we describe the main statistics (averages and standard deviations) on business cycle synchronization, bilateral trade intensity, the extent intra-industry trade, asymmetries in structures of production and trade for our sample of countries over the 1965-2004. In addition, we will highlight the evolution of these variables for Latin America vis-à-vis China and India. Table 1 presents our summary statistics for all the variables involved in our analysis during the period 1965-2004.

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[15] Presumably, trade intensity would increase the farther the countries in the pair are to alternative markets. Following Wei (1996) and Deardorff (1998), we construct a formula for the remoteness of country i as the weighted average of that country's distances to all of its trading partners (except for the country j involved in a determined country pair), using as weights the share of the partner's output in world GDP. That is, for a determined (i,j)-country-pair, the remoteness of country i is defined as $REM_i = \sum_{m \neq j} \left(\frac{y_m}{y^W} \right) d_{im}$. Stein and Weinhold (1998) argue that this measure complies with several desirable properties for a measure of remoteness.

[16] The specification of our gravity equation model follows Rose and Engel (2001).

Business Cycle Synchronization. In Figures 1.1 and 1.2 we present the 10-year window rolling correlation of real output fluctuations for LAC sub-regions vis-à-vis China and India over the 1981-2004 period. We present the evolution of these correlations for Latin America as well as some selected sub-regions such as Mexico, Central America and the Caribbean (excluding Mexico), Andean countries and the Southern Cone.

We first observe that the output correlation between the LAC region and China rises sharply over time from -0.22 in 1981 to 0.46 in 2004. This upward trend is mainly attributed to the rising output correlation between: (a) China and the Andean countries that increases from -0.31 in 1981 to 0.54 in 2004, and (b) China and the Southern Cone that goes up from -0.11 to 0.63 over the same time period. On the other hand, Mexico displays a declining output correlation with China that becomes negative since 1988. Finally, output fluctuations in Central America and the Caribbean are negatively associated to business cycle in China for most of the period. This correlation is increasingly negative since the beginning of the 1980s, reaching -0.67 in 2004 (see Figure 1.1).

Second, output fluctuations for Latin America vis-à-vis China are negatively associated with cyclical fluctuations in India's real output for most of the period, although showing an upward trend. Specifically, the correlation has increased from -0.49 in 1981 to -0.17 in 2004. An analogous pattern of co-movement is displayed by all sub-regions except for Central America and the Caribbean. In the latter case, the cycle synchronization with India shows a declining trend up to 1993, and afterwards it increases from -0.59 to -0.06 in 2004 (see Figure 1.2).

Finally, we claim that the upward trend in the output correlation of LAC might be attributed by the increasing demand for commodities from China and India. In particular, the Chinese demand for commodities has increased approximately 50 percent between 2000 and 2003, with China representing approximately 28 percent of the world consumption of steel in 2003, 27 percent of the world consumption of iron ore, 21 percent of aluminum, 21 percent of zinc, 19 percent of copper, and 11 percent of nickel (Fiess, 2005). Hence, we investigate the impact of year-over-year (y-o-y) percentage changes of monthly industrial production (IPI) in China and India on the y-o-y variation of monthly IPI in Latin American countries.[17] To investigate whether the

[17] We specifically use monthly data on the index of Industrial Production for China, India and the major Latin America and the Caribbean countries from January 1997 to December 2005. Note that in the case of

relationship has changed over time, we apply recursive OLS using 36 observation as a base period and adding one observation at a time until the sample end (2005.M12) is reached. To distinguish the impact of China and India from global trends, we include US industrial production as a control variable and only include the portion of Chinese industrial production as a regressor which is orthogonal to US industrial production —see more details in Fiess (2005).

Figure 2.1 shows that 2002-3 may represent a turning point in the relationship between Chinese industrial production and world commodity prices. Not only China seems to have a positive and significant impact on world commodity prices but also its effect has increased over time. In particular, metals and minerals as well as beverages (especially, coffee) seem to be most affected by the rapid growth in China. An analogous behavior is exhibited by the correlation between Chinese IPI and the world price of crude oil, where the coefficient estimate for industrial production in China grew from 0.81 at the beginning of 2002 to 1.88 by the end of 2005. On the other hand, Figure 2.2 reports the relationship between Indian IPI and world commodity prices. This relationship has become shows an upward trend and has become significant since 2003, with the exception of crude oil prices.

Trade Integration. Figure 3 shows the evolution of bilateral trade intensity (normalized by output) of the LAC region vis-à-vis China and India.[18] For all sub-regions we observe that trade links have grown deeper between LAC and China and LAC and India over the last 20 years. On average, the bilateral trade coefficient between LAC and China tripled in 1995-04 relative to 1985-94, while the one with India is now four times the one in 1985-94. In particular, Mexico and the Andean countries show the largest increase in trade intensity with China (see Figure 3.1), while trade integration with India was more dynamic among Andean countries (see Figure 3.2).

In addition, Figure 4 depicts the evolution of the Grubel-Lloyd index of intra-industry trade (*IIT*) of the LAC region with China and India. Intra-industry trade between LAC and China almost doubled in 1995-04 relative to 1985-94, whereas it almost tripled with India. While the former is mainly explained by primary sectors, machinery and transport equipment, the latter is attributed to an increasing trade share in chemicals (where LAC is a net importer). In the case of Mexico,

Central America and Caribbean nations, we use monthly indices of economic activity due to the lack of information on IPIs for these countries. The sources of data are DECPG and Haver database, and the *Secretaria Ejecutiva del Consejo Monetario Centroamericano*.

[18] Here we report the anti-log of the expressions reported in equation (5) —that is, we graph the ratio of bilateral trade between the country pairs relative to their total trade flows or their total outputs. From now on, we will discuss the bilateral trade figures normalized by total output in the country pair.

IIT with China grew more than 50 percent while Mexico's *IIT* with India more than tripled. Finally, we observe that *IIT* between Andean countries and China increased significantly over the last 20 years.

Specialization in Production and Foreign Trade. Figure 5 presents the evolution of the asymmetries in the structure of production ($ASP_{i,j}$) for LAC vis-à-vis China and India. We should note that asymmetries in structures of production of LAC vis-à-vis China and India have decreased in the last 20 years, although at a faster pace with India. In the case of Mexico, note that although asymmetries in structures of production with China have remained almost invariant in 1995-04 relative to 1985-94, asymmetries in the basket of exports and imports with China have declined (see figures 5 through 7). On the other hand, asymmetries in export structures with China have increased over time for all sub-regions of the LAC region.

In addition, we evaluate whether LAC countries compete with either China or India in LAC's relevant export markets by constructing *export similarity index* (ESI). We use export flows by partner and commodity code using the COMTRADE harmonized system database. Following Finger and Kreinin (1979), the export similarity index is

$$ESI(i, j; p) = \left\{ \sum_k \min\left[X_k(i, p), X_k(j, p)\right] \right\} \cdot 100$$

$ESI(i,j;p)$ measures the extent of similarity of the export patterns of countries *i* and *j* to market *p*, with $X_k(i,p)$ being the share of commodity *k* in country *i*'s exports to country *p*. The index ranges from 0 to 100, it takes the value of *0* if the basket of exports of countries *i* and *j* to trading partner p is completely different —that is, they do not compete in *p*'s market. On the other hand, it takes the value of 100, if their basket of exports to country *p* is the same. Here, we are specially interested in evaluating the similarity of the LAC export basket vis-à-vis China and India in the US market.

Figure 8 shows the *ESI* between LAC, China and India with respect to the US market for the periods 1985-94 and 1995-04.[19] Mexico's export basket is the one that resembles the most to the

[19] When comparing the export similarity of LAC, India and China with the OECD-European market, we find the following: (a) Indian exports are more oriented towards the OECD-European markets. On average, 25 percent of the value of their exports goes to this region. (b) The US market becomes increasingly important for LAC countries. It represents 60 percent of their exports in 2002, while the OECD-Europe market has declined in importance —from 30 percent of their exports in 1978 to 12 percent in 2002. (c) Before 1992, the value of Chinese exports to OECD-Europe was larger than the one oriented to the US

Chinese basket of exports to the US. In addition, the ESI between LAC sub-regions and China has declined over time —especially in the case of Andean countries and the Southern Cone. This implies a reduction in the degree of competition with China in the US market for these sub-regions (see Figure 8.1). Finally, we observe that *ESI* between LAC and India has increased slightly as is the case of Mexico. The other sub-regions show only a slight reduction in competition with India in the US markets.

4.2 Correlation Analysis

Before we discuss the regression analysis, we present some basic correlations between our measure of output synchronization, bilateral trade intensity, intra-industry and asymmetries in the structure of production, exports and imports for our panel data of country pairs during the period 1965-2004. Our results are reported in Table 2.

We find that the correlation between LAC and industrial countries is negative (-0.04). On the other hand, the output correlation among LAC countries and the one between LAC and other developing countries is positive (0.034 and 0.029, respectively). This may suggest the prevalence of inter-industry trade when considering LAC and industrial country pairs. Furthermore, we find that while the correlation between output co-movement and trade intensity between LAC economies and China is positive (0.14), it is negative between LAC countries and India (-0.13).

Second, we find that output correlation and the degree of intra-industry trade are positively related for the samples of LAC-Industrial countries (0.07), LAC countries (0.09) and LAC-Developing country pairs (0.03). Again, higher intra-industry trade is associated to higher output co-movement for (LAC, China) country pairs, while the converse is true for (LAC, India) country pairs (0.07 and -0.07, respectively).

Finally, we find a weak positive relationship between asymmetries in production between LAC and industrial country pairs, while the association is negative among LAC countries and for LAC-Developing country pairs. This implies that higher asymmetries in production structures may lead to more asynchronous business cycles. This result holds for (LAC, China) and (LAC, India) country pairs.

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market. However, since 1992 this trend was reversed and the US has become the main destination of Chinese exports.

4.3 Regression Analysis

4.3.1 Estimates for our Baseline Regression

In order to evaluate the impact of trade integration and specialization on the cycle synchronization of LAC countries with China and India we first present OLS estimates of our baseline regression —that is, equation (8). For the present regression analysis we use the *LAC Sample* which consists of country pairs that include Latin American countries —that is LAC-Industrial, LAC-Developing and LAC-LAC country pairs.

In Table 3 we present the least squares estimates of our baseline regression that includes country-pair dummies, country-group dummies (LAC-Developing and LAC-LAC country pairs), time-period dummies (dummies for 1975-84, 1985-94 and 1995-04). In addition, we include time dummies specific to (LAC, China) and (LAC, India) country pairs. The latter would allow us to compute the impact of demand spillovers from China and India to LAC economies. From now on, our discussion will focus on the results obtained with the bilateral trade intensity normalized by output.

We first find that countries with higher bilateral trade intensity —either normalized by total trade or total output— usually display higher business cycle synchronization. We observe that all the coefficient estimates of trade integration are positive and significant regardless of their normalization factors and the control variables included in the regression. Using the coefficient estimates in column [4]-[6] of Table 3 we can illustrate the economic significance of our regression analysis. For instance, if trade integration with China for the median country in the region (Paraguay, with an average log of trade intensity of -8.9 in 1995-04) raises sharply to the levels observed by the leader of the region (Mexico, with -5.85), its output correlation with China will increase by 0.011. On the other hand, an analogous shift in trade integration with China for the worst trade performer (Haiti) would imply, on average, an increase in output correlation of 0.023. On the other hand, regarding trade integration with India, we perform analogous exercises. If trade integration between the median LAC country and India (Guatemala, -10.4 in 1995-04) increases sharply to the levels of the leading country (Argentina, -7.3), its output correlation will rise by 0.011. For the country with the lowest trade share with India (Nicaragua,-13.25 in 1995-04), reaching the levels of trade intensity displayed by Argentina implies an output correlation with India that is higher by 0.021. Finally, if the average country in Central America (excluding Mexico) increases its trade integration with either China or India to the levels displayed by South America, its output correlation with those countries will increase by 0.01.

Second, countries with higher degree of intra-industry trade tend to show a larger cyclical output correlation. We observe that all coefficient estimates associated to the Grubel-Lloyd index of intra-industry trade (*GLI*) are positive and significant regardless of the specification used. Again, our estimates in columns [4]-[6] of Table 3 using trade intensity normalized by output suggest that an increase in the extent of intra-industry trade between Central America and the Caribbean with China to the levels displayed by the average Andean country would lead to a higher output correlation by 0.015, and by 0.037 if the increasing intra-industry trade reaches the levels displayed by Mexico. On the other hand, we find that output correlation between India and the average country in the Central America and the Caribbean would increase by 0.019 if their intra-industry trade go up to the levels displayed by the average Southern Cone country. In addition, the correlation for the average Central American country would increase by 0.051 if its intra-industry trade with India rises to the level of Mexico.

Finally, we find that countries with similar patterns of specialization in either production or trade tend to display more symmetric business cycles. However, the results are not robust: the coefficient of *ASP* and *ASX* is negative and significant only when using trade intensity normalized by output. Economically speaking, we find that a reduction in the asymmetries of export structures between the average Central American country and China to the ones displayed by China and Mexico would be associated with an increase in output correlation of 0.012, while an analogous reduction for the average Andean country would enhance the cycle correlation by 0.02.

Controlling for Endogeneity in Trade Intensity. The association between trade intensity and cycle correlation could be attributed to reverse causality or to both variables being explained by a third one omitted from the model (e.g. the monetary union). In this context, the OLS estimates presented above would be biased and inconsistent. Hence, we need to find instruments for bilateral trade in order to estimate our coefficient of interest more consistently. We take advantage of the vast literature on the gravity equation of international trade in order to choose our set of instruments for the bilateral trade intensity (Frankel and Romer, 1999; Rose, 2000). Following this literature, bilateral trade intensity between countries i and j is instrumented with the: distance between countries *i* and *j*, remoteness of countries *i* and *j*, population density in both countries, dummy variables for common border, common language, colony, geographic region, legal origin, common main trading partner, islands, landlocked countries and dummy for regional free trade agreement. Except for the dummy variables, the determinants are expressed in logs.

Our results for the gravity model of bilateral trade (*i.e.* first stage regressions) are presented in Table 4. In general, we find trade intensity elevates among countries that: (a) are closer in distance, share a common border, have trading partners that are farther away from the rest of the world and are members of the same region, (b) have larger population density, (c) have engaged in a free trade agreement or have the same main trading partner, (d) speak the same language and belong to the same geographical region.

Instrumental Variables (IV) Estimation

Based on the first stage results, we re-estimate our baseline regression using *instrumental variables* (*IV*). Our IV estimates, presented in Table 5, confirm our results: higher business cycle synchronization between countries could be explained by rising trade intensity —especially, along the lines of intra-industry trade— and increased similarities in the patterns of specialization in production and foreign trade (in particular, exports). Note that these results are robust to changes in the specification of the model and to the use of different measures of bilateral trade intensity.

Based on the coefficient estimates of columns [4] through [6] in Table 5 that uses bilateral trade intensity normalized by output, we may provide the following economic interpretation:

Trade integration: We first simulate the impact on output correlation of an increase in trade intensity for a selected LAC country to the maximum level of trade integration in China (Mexico with a log of trade intensity normalized by output of -5.85 in 1995-04). The increase in output correlation for the least integrated country with China (Belize) would lie between 0.06 and 0.081, while the output correlation with China for the median country in terms of trade intensity with China (Paraguay) would increase between 0.029 and 0.039. Second, we also find that if the average levels of trade integration with China for Central America and the Caribbean (excluding Mexico) rises to the levels displayed by the Southern Cone, the output correlation with China of Central America would go up by 0.028-0.039. Analogously, an increase in the average trade intensity with China of the Andean countries to the Southern Cone standards would raise its output correlation with China, although to a lesser extent —i.e. output correlation between Andean countries and China would increase between 0.007 and 0.01.

We carry a similar exercise for trade integration of LAC countries with India. In this case, Argentina and Brazil show the largest trade integration with India (with an average of -7.35 in 1995-2004). In this case, rising trade integration for Nicaragua (the minimum value in trade intensity for 95-04) would raise output correlation between 0.055 and 0.075, whereas it would increase between 0.028 and 0.039 for the median country in the LAC sample (Ecuador). On the other hand, if the trade integration between Central America and the Caribbean and India raises to the levels of Southern Cone and India, its output correlation would increase between 0.024 and 0.032, while the impact for the Andean countries would be between 0.012 and 0.016.

Degree of Intra-Industry Trade. We find that among LAC countries, Mexico and Venezuela show the largest Grubel-Lloyd index of intra-industry trade with China (at an average of 0.15 for the 1995-04 period). If the median country in the LAC sample (Ecuador) were to raise its degree of intra-industry trade to the levels of Mexico, its output correlation would increase by 0.037, while for countries in the 75% percentile of the LAC sample (Argentina and Uruguay) the increase in output correlation would be 0.025.

Analogously, we find that Brazil shows the largest degree of intra-industry trade with India (with an average of 0.22 for the period 1995-2004), followed by Mexico (with 0.18). Again, we simulate the impact on output correlation of higher intra-industry trade for the median country (Ecuador and Colombia) and the 75% percentile (Paraguay) of intra-industry trade in the LAC sample of country pairs with India. We find that higher intra-industry trade for the median country would lead to an increase in output correlation between 0.051 and 0.055, while for Paraguay (75^{th} percentile) the cycle synchronization with India will increase between 0.049 and 0.052.

Asymmetries in Structures of Production (ASP). In column [4] of Table 5 we report the regression results using the asymmetries in economic structures. Interestingly we find that for the period 1995-04, Venezuela has the lowest value in the *ASP* index with China (with an average of 0.22) while Panama exhibits the largest value (with 0.73). Here we will simulate the impact on output correlation of reaching the levels of *ASP* displayed by Venezuela (the country with the lowest value of *ASP*) for selected LAC countries. In this case, we find that for country with the median *ASP* with China (Paraguay) a further reduction in the *ASP* (to Venezuelan levels) raises its output correlation by 0.12, while the increase in output correlation for Argentina (75^{th} percentile) of a reduction in *ASP* is 0.17. On the other hand, we also find that Paraguay show the lowest degree of asymmetries in structures of production with India (0.046) while Panama show the largest asymmetries (0.536) over the period 1995-04. We find that a reduction in *ASP* to the minimum levels by countries such as Costa Rica (median) and Argentina (75th percentile) would lead to an increase in output correlation of 0.077 and 0.099, respectively.

Asymmetries in Foreign Trade Structure. Our regression analysis uses measures of asymmetries in the structure of exports and imports for LAC countries vis-à-vis China and India. Here, we will analyze the economic impact of changes in the asymmetries of the structure of exports (*ASX*) using the coefficients in column [5] of Table 5. We should note that Mexico is the country in LAC with the lowest value of the *ASX* index with China —that is, the export basket of Mexico is the one that resembles the most with the Chinese export basket among LAC economies (with an average of 0.89 for the period 1995-04). On the other hand, Chile, Ecuador and Venezuela show the largest index of *ASX* for the period 1995-04, with values fluctuating between 1.64 and 1.7. We again simulate the gains in output correlation for selected LAC countries of a decline in the degree of asymmetries in the export basket with China. In the case of Venezuela (the country with the largest degree of asymmetries in exports), the output correlation with China may increase by 0.027, whereas in the case of the median country (Uruguay) the output correlation with China goes up by 0.016.

Finally, we evaluate the reduction of asymmetries in export baskets of LAC countries vis-à-vis India. Again, we should note that the countries with the lowest degree of asymmetries in export structures with India are Uruguay and Brazil (with an average index of 1.07 and 1.13 for the period 1995-04, respectively). We simulate the impact on output correlation of reducing the degree of asymmetries in export structure relative to India for some LAC countries vis-à-vis India to the levels displayed by Uruguay and Brazil. Again, we find that for Ecuador and Venezuela (the countries with the largest asymmetries in export structure with India), output correlation increases by 0.02. In addition, the increase in output correlation with India for the median (LAC,India) country pair (that is, Mexico and Peru) is approximately 0.01.

4.3.2 Trade Intensity and Cycle Synchronization: The Role of Structural Asymmetries and Intra-Industry Trade

There is evidence that suggests that the link between trade intensity and cycle correlation is stronger among industrial countries than among developing countries or mixed industrial-developing country pairs (Calderón, Chong and Stein, 2006). These differences in the responsiveness of cycle synchronization to trade intensity are broadly explained by patterns of specialization and international trade in the country pair. It has been argued that industrial country pairs are more likely to have more symmetric structures of production and foreign trade as well as a higher degree of intra-industry trade compared developing and mixed industrial-developing country pairs. Note that this conjecture is corroborated by Calderon et al. (2006). Regarding the country pairs that we are interested in analyzing, LAC-China and LAC-India (*i.e.* developing country pairs), increased trade intensity may lead, on average, to increased specialization in different industries, which would lead to asymmetric effects of industry-specific shocks.

Complementing the evidence presented in Calderon et al. (2006) we explore the role of structural asymmetries (in production and foreign trade) and intra-industry trade in determining the sensitivity of cyclical output correlation to higher trade integration among country pairs. In particular, we run the following regression:

$$\rho(\tilde{y}_i, \tilde{y}_j)_\tau = \alpha_{i,j} + \beta_\tau + \gamma_0 T^K_{i,j,\tau} + \phi GLI_{i,j,\tau} + \delta ASP_{i,j,\tau} + \gamma_1 T^K_{i,j,\tau} \cdot ASP_{i,j,\tau} + \gamma_2 T^K_{i,j,\tau} \cdot GLI_{i,j,\tau} + u_{i,j,\tau} \qquad (9)$$

where we include two interaction terms that capture complementarities between bilateral trade intensity and: (a) similarities in the structure of production (as well as in foreign trade), and (b) the pattern of intra-industry trade. It has been argued that similarities in the structure of production as well as in the structure of foreign trade may affect the responsiveness of cycle correlation to trade integration since similar economies are more prone to show a pattern of intra-industry specialization. Hence, the coefficient for the interaction term γ_1 is expected to be negative and significant. That is, the impact of trade integration on cycle correlation should be weaker for countries with more asymmetries structures of production or trade. On the other hand, we include the interaction between Grubel-Lloyd index of intra-industry trade and the ratio of bilateral trade intensity. This would allow us to differentiate the impact on business cycle synchronization of inter-industry from the effects of intra-industry trade. According to the literature, we expect the coefficient of γ_2 to be positive and significant.

Table 6 reports the full specification of our regression analysis where we include not only the interaction term between trade intensity and the degree of intra-industry trade but also the interaction between trade intensity and structural asymmetries in production or foreign trade. When adjusting this regression for our LAC sample, we find a positive and robust coefficient estimate for the coefficients of bilateral trade intensity normalized by output (*TI*) and Grubel-Lloyd index of intra-industry trade (*GLI*). On the other hand, the coefficient estimate for the interaction between *TI* and the *GLI* is positive although not statistically significant. Finally, we find that the asymmetries in structures of production and foreign trade have the expected negative sign. The same holds for its interaction with *TI*. However, we are unable to find a statistically significant relationship for all these coefficient estimates with the exception of asymmetries in structures of production (*ASP*) —see columns [1] and [4] in Table 6. [20]

To give an economic interpretation to our coefficient estimates we will perform the following simulation exercise: we will evaluate the gains in output correlation for the country *l* in the LAC region vis-à-vis China and India to an increase in trade intensity to the levels exhibited by the countries more integrated with China and India —that is, Mexico in the case of trade with China and Argentina and Brazil in the case of India. For this exercise we will keep constant the degree of asymmetries in the structure of production or foreign trade of LAC countries with China and India. The results are reported in Table 7.

Effects of Higher Integration with China. We assess the potential gains in output correlation with China of higher integration in a group of selected LAC countries (and sub-regions) if its bilateral trade intensity with China were to increase to the levels displayed by Mexico —that is, the country with the highest degree of trade integration with China. In order to compute this effect not only we take into account the direct impact of trade integration on cycle correlation but also its effects through intra-industry trade and through the interaction between asymmetries in structures of output / foreign trade and trade integration. Note that for this exercise we keep constant the degree of structural symmetries (either on output or foreign trade) of LAC countries with China. For more details on the results, see columns [1] through [3] in Table 7.

According to the simulations presented in Table 7, the countries with higher potential increases in output correlation with China are those with the lowest degree of trade integration with China. For instance, higher trade integration with China would raise the output correlation for Belize (the country with the lowest degree of trade integration with China) between 0.10 and 0.14. In what follows we calculate the potential increase in output correlation due to deeper trade links with

[20] We should note that for the full sample of country pairs —that is, including non-LAC country pairs— we find the interaction terms to be negative and statistically significant. The results are not reported here but available from the author upon request.

China for selected LAC sub-regions. We specifically find that if reaching the levels of trade intensity for Mexico and China, the output correlation for Central America and the Caribbean and China will increase between 0.08 and 0.12. In addition, the output correlation with China of the Andean countries will go up by 0.047-0.072, whereas the cycle correlation for countries in the Southern Cone will increase on average between 0.064 and 0.094.

Effects of Trade Integration with India. In columns [4] through [6] of Table 7, we present the simulations for (LAC, India) country pairs. Again, we compute the potential increase in output correlation if trade integration for selected countries and sub-regions in Latin America surges to the level of the leader in trade intensity with India —that is, Brazil. The sub-region that shows the smallest degree of trade integration, Central America and the Caribbean, is the one that registers the largest potential increase in output correlation with India —that is, between 0.09 and 0.12. Finally, we should note that higher trade integration with India for the Andean countries may rise the output correlation with India by 0.08-0.10, while the output correlation for countries in the Southern Cone increases by 0.05-0.07.

V. Explaining changes in output correlation of LAC countries vis-à-vis China and India

In the present section we evaluate the ability of our regression model to track changes in the cyclical correlation of Latin America vis-à-vis China and India and to what extent those changes are attributed to the evolution over time of trade integration and the patterns of specialization in production and foreign trade.

In addition to trade integration and specialization, we compute the contribution of demand spillovers to explaining the changes in business cycle synchronization in Latin America vis-à-vis China and India. The time dummies in our regression analysis of Table 6 capture the impact of global shocks on LAC countries vis-à-vis the rest of the world. However, in order to capture the specific impact of global shocks specific to (LAC, China) and (LAC, India) country-pairs we included not only time dummies in our specification but also time dummies interacted with (LAC, China) and (LAC, India) country pairs. These set of parameters will allow us to compute the impact of demand spillovers on cycle correlation specific to those country pairs.

Business Cycle Synchronization between LAC and China. In Table 8 we report the actual and predicted changes in cyclical output correlation in the period 1995-2004 relative to 1985-1994 for

LAC countries and sub-regions vis-à-vis China. We calculate the contribution of foreign trade, (output and/or foreign trade) specialization, and demand spillovers using the IV regressions [4] through [6] reported in Table 6. According to this regression, business cycles among countries become more synchronized if structures of production are more symmetric and there is a higher degree of intra-industry trade among countries.

Panel I of Table 8 reports the changes in output synchronization predicted by our model for selected regions in Latin America vis-à-vis China. We find that, on average, our model does a fairly decent job predicting the changes in output correlation for the Latin America and the Caribbean (LAC) region vis-à-vis China. Using the coefficient estimates of equation [4] in Table 6 which includes the *ASP* index, we find that trade integration, output specialization and demand spillovers predicted an increase in output correlation between LAC and China of 0.151 —that is, these variables explain 54 percent of the actual change in cycle correlation. Note that of the 0.151 increase in business cycle synchronization explained by our model, almost two-thirds are explained by demand spillovers from China and India (0.099), 20 percent is attributed to output specialization (0.031), and the remaining 14 percent (0.021) is attributed to higher trade intensity with China. In addition, when we use the coefficient estimates of equations [5] and [6] —that is, including the index of structural asymmetries in exports and imports, respectively, instead of *ASP*— we find similar results. Specifically, our model predicts between 40 and 56 percent of the predicted changes in output synchronization between the LAC region and China.

When we break down the LAC region into sub-regions, we find that our model does a poor job explaining the evolution of output correlation for Central America and the Caribbean with China. While this output correlation actually declines over time (-0.042), our model predicts an increase in output correlation (0.146). On the other hand, our model predicts an increase in the output correlation with China of the Andean countries and the Southern Cone, with a better fit for the latter group. In particular, we find that our model predicts more than three-quarters of the change in business cycle synchronization of the Southern Cone with China (0.123 vs. 0.160, respectively).

When we analyze the ability of the model to predict output correlation changes vis-à-vis China for our sample of LAC economies, we observe that the performance of the model varies across countries and that the model usually cannot track declines in output correlation. Regarding the major LAC countries, the output correlation between Brazil and China increased 0.147 in 1995-

04 relative to 1985-94. Our model predicts an increase in output correlation between 0.084 (model with *ASP*) and 0.201 (model with *ASM*), with trade integration with China explaining between 25 and 30 percent of the predicted changes in correlation.

In addition, the cycle synchronization between Chile and China increased 0.483 and the model predicted an increase of 0.09-0.143 (that is, between 20-30 percent of actual variation). In this case, the increase in output correlation is mostly explained by demand spillovers (between 70 and 87 percent). An analogous result holds for the correlation between Peru and China. That is, the output synchronization between Peru and China grew by 0.391 in 1995-04 relative to 1985-94 and our model predicted an increase of 0.1-0.19 for the same period, mostly attributed to demand spillovers (between 52 and 77 percent of the predicted increase in correlation). In the case of Chile and Peru the important role of demand spillovers is attributed to the increasing demand of metals and minerals—in particular, copper from Chile, and copper, gold and platinum from Peru. We should also note that China had a share of 19% of world copper ore imports in 2004 (second largest importer in the world after Japan) and that this share elevates to 25% if we include copper waste and scrap (Trinh and Voss, 2006). Interestingly, in the case of Venezuela we find that our model over-predicts the increase in output correlation with China. While the output correlation between these two countries has increased by 0.05 in 1995-04 relative to 1985-94, the model predicts an increase of 0.11-0.23 with trade integration and output specialization explaining between 35-60 percent of the predicted increase in correlation. In this case, Venezuela has benefited from the increasing Chinese demand for oil. Today, China is the world's third largest importer of oil and accounts for approximately 6.8 percent of world imports and 8.5 percent of world consumption in 2005 (British Petroleum, 2006).

On the other hand, the output correlation between Argentina and China declined in 1995-04 relative to 1985-94 (-0.2), our model suggests that the evolution of trade and production specialization would have predicted an increase of their output correlation of 0.1-0.12. Finally, in the case of Mexico, our model predicts an increase in the output correlation between Mexico and China of 0.07-0.11 while the actual correlation declined 0.349 in 1995-04 relative to 1985-94. In this case, we should note that structural asymmetries in foreign trade help explain a decline in correlation, while the contribution of trade integration explain between 30-50 percent of the predicted increase in correlation.

Business Cycle Synchronization between LAC and India. Table 9 presents the actual and predicted changes in cyclical output correlation in the period 1995-2004 relative to 1985-1994 for LAC countries and sub-regions vis-à-vis India.

We observe that, on average, the output correlation of the LAC region with India has increased 0.134 in 1995-04 relative to 1985-94 and our model predicts an increase that ranges between 0.126 (model with *ASM*) and 0.232 (model with *ASP*). We also observe that almost 70 percent of the predicted increase in correlation is attributed to demand spillovers in the *ASP* model. Note that in the case of Central America and the Caribbean, the model does a better job in tracking changes in output correlation than when analyzing Central America and China. That is, the model predicts an increase in output correlation between Central America and India of 0.112 (*ASM* model), 0.16 (*ASX* model) and 0.22 (*ASP* model), whereas the actual correlation increased 0.175. In the case of the Andean countries, the model predicts an increase in correlation (0.13-0.24) that is significantly higher than the actual increase (0.02). Finally, the model performs fairly in predicting changes in output correlation between India and the Southern Cone. While the actual correlation increases by 0.213, the *ASM* and *ASX* model predict that the correlation grows between 0.127 and 0.161, while the *ASP* model predicts and increase of 0.246. Again, demand spillovers seem to be the most influential factor in explaining predicted changes in correlation in the *ASP* model, while trade integration has an increasing role in the other models.

Next we discuss the performance of the model in predicting the changes in correlation between selected LAC countries and India in 1995-04 relative to 1985-94. We observe that in most cases, our model of trade and output specialization predicts an increase in correlation although the output correlation of LAC countries with India declined in 11 out of 22 countries in the LAC region. The country with the largest increase in output correlation with India is Argentina which increased from -0.712 in 1985-94 to 0.445 in 1995-2004 (an increase of 1.156). Our model only explains an increase of 0.256 with the *ASP* model (that is, 22 percent of the actual variation) and only 0.11-0.14 with the other models. Also, note that for Peru and Venezuela, our ASP model explains almost 50 percent of the actual increase in output correlation with India. In both cases, a reduction in output asymmetries contributes to explain more than one-third of the increase in output correlation. Finally, we find that for decline in output correlation with India for some LAC countries may be attributed to an increase in the structural asymmetries in exports and imports.

VI. Concluding Remarks

Using a sample of 147 countries for the period 1965-2004 we update and extend the findings of Calderon, Chong and Stein (2006) on the link between output comovement, trade intensity and specialization with an special application to LAC countries. Our regression results confirm and complement their results along the following dimensions: First, countries with increasing trade linkages between will display more synchronous business cycles. Second, countries with increasing specialization in either output or foreign trade structures will display more asynchronous output fluctuations. To the extent that asymmetries in production and trade decline in LAC vis-à-vis China and India, we will observe rising output correlations. Finally, we argue that the sensitivity of business cycle synchronization to changes in bilateral trade is affected by the patterns of output and trade specialization among countries. We find this result for the full sample of country pairs, and we fail to find a robust result for the LAC-Rest of the World sample of countries.[21]

We use our regression results to evaluate the ability of the model to track changes in the degree of business cycle synchronization for LAC countries vis-à-vis China and India for the period 1995-2004 relative to 1985-94. We want to assess to what extent changes in trade and specialization patterns as well as demand spillovers can explain the evolution of output correlation for LAC countries. In general, we find that the performance of the regression model is fairly good when explaining the changes in output correlation for LAC as a region. However, the country-by-country performance of the model varies significantly.

We find that, on average, our model predicts more than half of the variation in output co-movement for LAC vis-à-vis China and that the model may over-predict the changes in cycle synchronization for LAC and India. In addition, we also find that:

First, demand spillovers and declining structural asymmetries in output seem to explain the predicted increase in output correlation for Central America and the Andean countries, while trade integration and demand spillovers seem to the be story for Mexico and the Southern Cone (see Figure 9.1). When we consider structural asymmetries in exports, trade integration and demand spillovers mostly explain the increase in output correlation with China for Mexico and all sub-regions of LAC. However, the evolution of asymmetries in export structures predicts a

[21] Specifically, we show that this sensitivity is higher for country pairs with more symmetric structures of production (as well as foreign trade). The results for the full sample of country pairs are not reported here but are available from the authors upon request.

decline in output correlation with China for China and Central America and the Caribbean (see Figure 11.1).

Second, trade integration seems to have a larger role in explaining increases in output correlation in Southern Cone countries than among Andean countries. In particular, we observe that for Brazil, Paraguay and Uruguay, trade integration predicts an increase in output correlation with China while output specialization signals a decline in this correlation. On the other hand, for the Andean countries, output specialization plays a larger role in explaining movements in output co-movement with China than trade integration in Peru and Venezuela, whereas for changes output specialization in Colombia and Ecuador vis-à-vis China predicts a decline in this correlation (Figure 10.1).

Third, increasing demand spillovers and less asymmetric structures of production are the factors that mostly explain the predicted increase in cycle synchronization for LAC and India. The same result holds for Mexico and all LAC sub-regions. Notice that while trade integration seems to explain 10 percent of the predicted increase in co-movement, output specialization explains between 20 and 25 percent of this predicted increase (see Figure 9.2). On the other hand, when incorporating asymmetries in the structure of exports (*ASX*), we find that changes in *ASX* predicts a decline in the output co-movement of Mexico and LAC sub-regions vis-à-vis India. On the other hand, approximately one third of the predicted surge in output correlation is explained by higher trade integration with India (see Figure 11.2).

Finally, we should note that when evaluating the performance of the model across countries, that the evolution of trade intensity and specialization patterns of LAC countries vis-à-vis China and India, the model predicts —in most cases— an increase in output correlation. However, we observe that this is not the case for some LAC countries in our sample and, especially in the case of the output correlation with India. Our results are consistent to some extent to existing evidence in the literature. For instance, Blázquez-Lidoy et al. (2005) find that the impact of Chinese trade on the region is generally positive, although this may imply a greater specialization of LAC towards commodities. On the other hand, further improvements could still be undertaken in the analysis of the determinants of output comovement for LAC countries vis-à-vis China and India. For instance, the failure of the model to explain the variation in the output correlation of Mexico with China could be attributed to the omission of bilateral foreign direct investment. According to García-Herrero and Santabárbara (2005), there is evidence of FDI diversion from LAC recipients to China and this is mainly attributed to the negative impact on FDI flows to Mexico and Colombia. Other factors to evaluate are the impact on cycle correlation of increasing financial integration (Imbs, 2004) and macroeconomic policy convergence (Clark and van Wincoop, 2001). Although these extensions go beyond the scope of the paper, some of them are hard to implement due to data availability problems.

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Table 1
Basic Statistics, 1965-2004 *(10-year average observations)*

	Output Correlation 1/	Bilateral Trade Intensity 2/		Intra-Industry Trade 3/	Structural Asymmetries in:		
		% Trade	% Outputs		Production	Exports	Imports
Latin America and the Caribbean Region (LAC)							
(LAC,IND)	0.117	-9.31	-10.02	0.0418	0.280	1.412	0.756
	(0.39)	(2.73)	(2.55)	(0.07)	(0.14)	(0.22)	(0.18)
(LAC,DEV)	0.035	-13.41	-13.98	0.0110	0.438	1.281	0.840
	(0.37)	(4.82)	(4.73)	(0.04)	(0.24)	(0.32)	(0.20)
(LAC,LAC)	0.095	-9.10	-9.88	0.0511	0.288	1.294	0.805
	(0.38)	(3.63)	(3.52)	(0.09)	(0.15)	(0.29)	(0.23)
China							
(China,IND)	-0.066	-6.33	-7.48	0.1177	0.988	1.192	0.632
	(0.39)	(1.58)	(1.92)	(0.09)	(0.20)	(0.20)	(0.10)
(China,DEV)	-0.013	-8.44	-9.70	0.0182	1.022	1.320	0.481
	(0.37)	(2.72)	(2.58)	(0.04)	(0.20)	(0.24)	(0.17)
(China,LAC)	0.058	-10.34	-11.89	0.0146	1.053	1.339	0.532
	(0.36)	(3.72)	(3.90)	(0.03)	(0.23)	(0.20)	(0.16)
(China,East Asia)	0.112	-8.34	-9.56	0.0958	0.994	1.221	0.493
	(0.38)	(4.67)	(5.12)	(0.15)	(0.24)	(0.26)	(0.23)
India							
(India,IND)	-0.033	-6.50	-7.76	0.1079	0.915	1.286	0.589
	(0.40)	(1.22)	(1.43)	(0.09)	(0.08)	(0.18)	(0.14)
(India,DEV)	0.044	-8.51	-10.10	0.0344	0.992	1.331	0.385
	(0.38)	(3.24)	(3.50)	(0.08)	(0.14)	(0.24)	(0.20)
(India,LAC)	-0.035	-10.20	-11.96	0.0144	0.971	1.319	0.425
	(0.35)	(2.16)	(2.14)	(0.03)	(0.14)	(0.18)	(0.18)
(India,South Asia)	0.107	-5.90	-7.48	0.0938	0.901	1.112	0.220
	(0.36)	(1.17)	(0.80)	(0.07)	(0.17)	(0.16)	(0.14)

1/We compute the correlation of the (band-pass filtered) cyclical component of real output in countries j and k. 2/ The bilateral trade intensity, as a share of total trade of the country-pair as well as the output in both countries, is expressed in logs. 3/ We present the Grubel-Lloyd index of intra-industry trade. Also note that IND denotes industrial countries, and DEV indicates developing countries.

Table 2
Correlation Analysis, 1965-2004 *(10-year average observations)*

	Bilateral Trade Intensity		Intra-Industry	Structural Asymmetries in:		
	% Trade	% Outputs	Trade	Production	Exports	Imports
Latin America and the Caribbean Region (LAC)						
(LAC,IND)	-0.0445	-0.0401	0.0703 **	0.0033	0.0087	0.0610 *
(LAC,DEV)	0.0184	0.0286	0.0263	-0.0179	0.0037	-0.0144
(LAC,LAC)	0.0471	0.0341	0.0926 *	-0.0314	-0.0235	-0.0536
China						
(China,IND)	-0.1006	-0.1921	-0.1911	0.1399	0.3537 **	0.3755 **
(China,DEV)	0.0942	0.0851	0.1616	-0.0679	0.0490	-0.0127
(China,LAC)	0.1200	0.1386	0.0709	-0.1071	0.2233	-0.2722 *
(China,East Asia)	-0.0352	-0.0542	0.1564	0.0815	-0.0839	0.0008
India						
(India,IND)	0.1292	0.0998	0.0825	-0.1294	-0.0447	-0.2610
(India,DEV)	0.0009	-0.0005	-0.0490	-0.0898	-0.1120	-0.0970
(India,LAC)	-0.1642	-0.1256	-0.0749	-0.0692	0.1633	-0.0097
(India,South Asia)	-0.1894	-0.1431	-0.1657	-0.0903	0.0421	-0.3415

Bote that IND denotes industrial countries, and DEV indicates developing countries.

Table 3
Baseline Regression: Least Squares
Dependent Variable: Output Correlation for countries j and k
LAC Sample, 1965-2004 (10-year period observations)

	Bilateral Trade Intensity (normalized by total trade)			Bilateral Trade Intensity (normalized by total output)		
	[1]	[2]	[3]	[4]	[5]	[6]
Trade Integration	0.003 **	0.004 **	0.003 **	0.003 **	0.004 **	0.004 **
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Grubel-Lloyd Index of Intra-Industry Trade	0.302 **	0.305 **	0.320 **	0.287 **	0.292 **	0.311 **
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Structural Asymmetries in:						
- Production (ASP)	-0.178	...	...	-0.234 *	...	...
	(0.14)			(0.14)		
- Exports (ASX)	...	-0.025	...	...	-0.029 *	...
		(0.02)			(0.02)	
- Imports (ASM)	...	...	-0.015	...	...	-0.012
			(0.03)			(0.02)
Dummies:						
Period 1/	Yes	Yes	Yes	Yes	Yes	Yes
Period x (China & India) 1/	Yes	Yes	Yes	Yes	Yes	Yes
Country Group 2/	Yes	Yes	Yes	Yes	Yes	Yes
Country Pairs	Yes	Yes	Yes	Yes	Yes	Yes

*1/ We include dummies for the period 1975-1984, 1985-1994 and 1995-2004. We also included time dummies multiplied by (LAC, China) and (LAC, India) country-pairs. They are separately included in our regressions and are intended to capture demand spillovers in LAC from China and India. 2/ The regression analysis includes dummies for (LAC,DEV) and (LAC,LAC) country pairs. Finally, note that numbers in parenthesis represent robust standard errors (White, 1984). * (**) indicates the the variable is statistically significant at the 10 (5) percent level.*

Table 4
First Stage Regressions: Gravity Model of Trade
Dependent Variable: Output Correlation for countries j and k
LAC Sample, 1965-2004 (10-year period observations)

Variable	Normalized by Total Trade [1]		Normalized by Outputs [2]	
Border (j,k)	1.578	**	1.156	**
	(0.42)		(0.40)	
Distance (j,k) (in logs)	-2.069	**	-2.088	**
	(0.15)		(0.14)	
Remoteness of j	11.273	**	9.865	**
	(0.81)		(0.75)	
Remoteness of l	10.148	**	8.395	**
	(0.79)		(0.72)	
Free Trade Agreement dummy	0.552	*	0.982	**
	(0.34)		(0.32)	
Population density of j	0.474	**	0.477	**
	(0.03)		(0.03)	
Population density of k	0.272	**	0.243	**
	(0.03)		(0.03)	
Common language dummy	1.865	**	1.501	**
	(0.22)		(0.19)	
Colonial Origin dummy	-0.742	**	-0.123	
	(0.22)		(0.19)	
Common Trading Partner dummy	2.058	**	1.873	**
	(0.47)		(0.43)	
Common Region dummy	1.330	**	0.906	**
	(0.21)		(0.19)	
Common Legal Origin dummy	-0.743	**	-0.871	**
	(0.10)		(0.10)	
Islands	-1.502	**	-1.306	**
	(0.09)		(0.09)	
Landlocked countries	-1.532	**	-1.455	**
	(0.11)		(0.11)	
Constant	-10.581	**	-8.707	**
	(1.10)		(1.00)	
Nobs.	9535		10479	
R**2	0.154		0.153	
Adjusted R**2	0.153		0.152	

*Note: Numbers in parenthesis represent robust standard errors (White, 1984). * (**) indicates that the variable is statistically significant at the 10 (5) percent level.*

Table 5
Baseline Regression: Instrumental Variables (IV) Estimation
Dependent Variable: Output Correlation for countries j and k
LAC Sample, 1965-2004 (10-year period observations)

	Bilateral Trade Intensity (normalized by total trade)			Bilateral Trade Intensity (normalized by total output)		
	[1]	[2]	[3]	[4]	[5]	[6]
Trade Integration	0.009 **	0.013 **	0.013 **	0.009 **	0.013 **	0.013 **
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Grubel-Lloyd Index of Intra-Industry Trade	0.253 **	0.239 **	0.255 **	0.248 **	0.240 **	0.255 **
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Structural Asymmetries in:						
- Production (ASP)	-0.597 **	...	...	-0.626 **	...	...
	(0.17)			(0.17)		
- Exports (ASX)	...	-0.034 *	...	...	-0.034 *	...
		(0.02)			(0.02)	
- Imports (ASM)	...	...	-0.011	...	...	-0.013
			(0.02)			(0.02)
Dummies:						
Period 1/	Yes	Yes	Yes	Yes	Yes	Yes
Period x (China & India) 1/	Yes	Yes	Yes	Yes	Yes	Yes
Country Group 2/	Yes	Yes	Yes	Yes	Yes	Yes
Country Pairs	Yes	Yes	Yes	Yes	Yes	Yes

1/ We include dummies for the period 1975-1984, 1985-1994 and 1995-2004. 2/ We include dummies for (LAC,DEV) and (LAC,LAC) country pairs.
*Numbers in parenthesis represent robust standard errors (White, 1984). * (**) indicates the the variable is statistically significant at the 10 (5) percent level.*

Table 6
Augmented Regression: Instrumental Variables (IV) Estimation

Dependent Variable: Output Correlation for countries j and k
LAC Sample, 1965-2004 (10-year period observations)

	[1]	[2]	[3]	[4]	[5]	[6]
Bilateral Trade Intensity (normalized by Total Output)						
Trade Integration (TI)	0.008 **	0.011 **	0.011 **	0.011 **	0.027 **	0.057 *
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.03)
Grubel-Lloyd Index of	0.516 **	0.521 **	0.528 **	0.361 *	0.517 **	0.472 **
Intra-Industry Trade (GLI)	(0.19)	(0.19)	(0.19)	(0.22)	(0.19)	(0.20)
GLI(j,k) * TI(j,k)	0.031	0.032	0.032	0.018	0.031	0.027
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Structural Asymmetries in:						
- Production (ASP)	-0.612 **	...	...	-0.654 **	...	...
	(0.17)			(0.19)		
- Exports (ASX)	...	-0.015	...	...	-0.017	...
		(0.02)			(0.02)	
- Imports (ASM)	...	...	-0.007	...	...	-0.692
			(0.03)			(0.48)
Interaction: Trade Intensity and Structural Asymmetries						
TI1(j,k) * ASP (j,k)	...	...	...	-9.17E-04	...	...
				(0.00)		
TI1(j,k) * ASX (j,k)	...	...	...	...	-1.13E-02	...
					(0.01)	
TI1(j,k) * ASM (j,k)	...	...	...	...	...	-5.83E-02
						(0.04)
Period-Specific Dummies						
D(75-84)	0.092 **	0.091 **	0.092 **	0.077 **	0.091 **	0.092 **
D(85-94)	-0.073 **	-0.072 **	-0.068 **	-0.086 **	-0.074 **	-0.068 **
D(95-04)	0.054 **	0.058 **	0.060 **	0.050 **	0.055 **	0.061 **
D(LAC,China)*D(75-84)	-0.102 *	-0.084	-0.081	-0.116 *	-0.097 *	-0.081
D(LAC,China)*D(85-94)	0.106	0.119	0.120	0.104	0.109	0.120
D(LAC,China)*D(95-04)	0.050	0.065	0.066	0.067	0.056	0.066
D(LAC,India)*D(75-84)	-0.221 **	-0.205 **	-0.203 **	-0.187 **	-0.214 **	-0.202 **
D(LAC,India)*D(85-94)	-0.050	-0.035	-0.035	-0.082	-0.044	-0.034
D(LAC,India)*D(95-04)	-0.051	-0.037	-0.035	-0.055	-0.045	-0.036
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Country-Pair Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country-Group Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Our regressions include: (a) dummies for the period 1975-1984, 1985-1994 and 1995-2004, and; (b) period dummies for the (LAC,China) and (LAC, India) country pairs. The latter are included to capture the effects of demand spillovers on LAC of China and India, respectively.
*Numbers in parenthesis represent robust standard errors (White, 1984). * (**) indicates the the variable is statistically significant at the 10 (5) percent level.*

Table 7
Effects on Business Cycle Synchronization of Higher Trade Integration vis-à-vis China and India

	Improves Trade Intensity to the level of:					
	(LAC, China) Leader			(LAC, India) Leader		
Country	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Argentina	0.025	0.031	0.037	0.042	0.054	0.054
Belize	0.103	0.118	0.143	n.a.	n.a.	n.a.
Bolivia	n.a.	n.a.	n.a.	0.097	0.114	0.129
Brazil	0.013	0.017	0.018	…	…	…
Chile	0.036	0.044	0.050	0.055	0.068	0.073
Colombia	0.049	0.057	0.077	0.065	0.081	0.088
Costa Rica	0.049	0.065	0.078	0.086	0.105	0.116
Dominican Republic	0.074	0.094	0.106	0.087	0.107	0.115
Ecuador	0.061	0.064	0.092	0.082	0.090	0.113
Guatemala	0.066	0.081	0.100	0.084	0.100	0.114
Guyana	0.095	0.132	0.136	0.095	0.127	0.127
Honduras	0.086	0.101	0.119	0.094	0.113	0.120
Haiti	0.096	0.130	0.119	n.a.	n.a.	n.a.
Jamaica	0.073	0.085	0.097	0.095	0.114	0.130
Mexico	…	…	…	0.015	0.020	0.021
Nicaragua	0.093	0.114	0.136	0.116	0.142	0.166
Panama	0.084	0.102	0.099	0.078	0.095	0.093
Peru	0.044	0.053	0.065	0.068	0.085	0.092
Paraguay	0.067	0.072	0.094	0.082	0.093	0.106
El Salvador	0.081	0.098	0.122	0.097	0.120	0.132
Suriname	0.083	0.097	0.119	0.096	0.119	0.136
Trinidad and Tobago	0.078	0.081	0.115	0.082	0.093	0.117
Uruguay	0.053	0.064	0.083	0.069	0.092	0.095
Venezuela	0.033	0.028	0.056	0.072	0.081	0.097
Central America (excl. Mexico)	0.082	0.100	0.116	0.092	0.112	0.124
Andean Countries	0.047	0.051	0.072	0.077	0.091	0.104
Southern Cone	0.039	0.046	0.058	0.050	0.063	0.068
Latin America	0.064	0.076	0.094	0.076	0.093	0.103

Note that columns [1] and [4] use the coefficient estimates of column [4] in Table 6, columns [2] and [5] use the estimates of column [5] in Table 6, and columns [3] and [6] use the estimates of column [6] in Table 6. In addition, the (LAC, China) leader in trade integration is Mexico, whereas the (LAC,India) leader in trade integration is Brazil.
n.a. implies that there is no complete data available for the country.

Table 8
Explaining Changes in Output Correlation for Latin America and the Caribbean vis-à-vis China
Changes in the period 1995-2004 relative to the period 1985-94

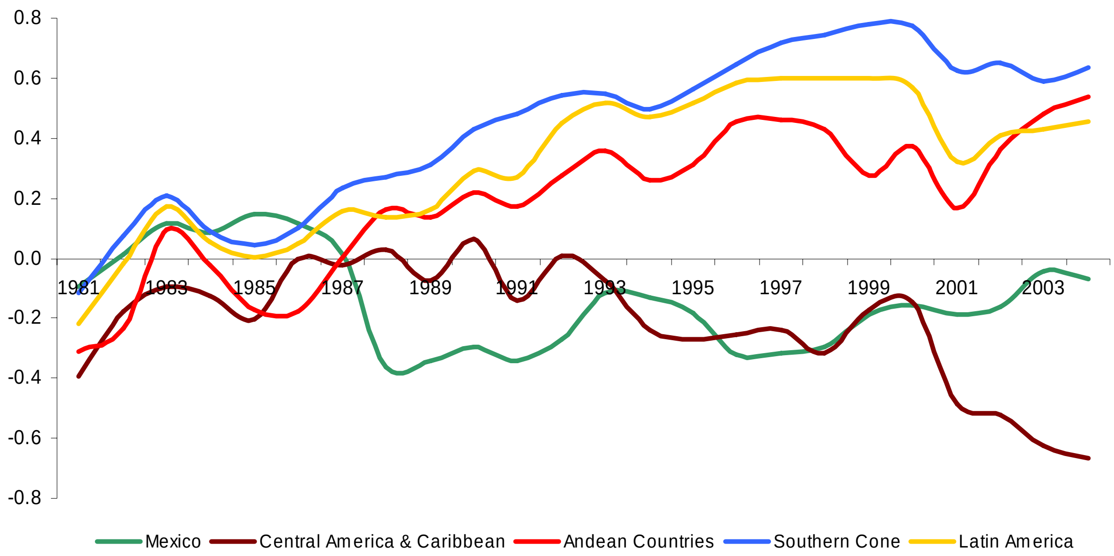
	Actual Correlation Change	ASP Model: Equation [4] of Table 6				ASX Model: Equation [5] of Table 6				ASM Model: Equation [6] of Table 6			
		Predicted Change in Correlation	Contribution to Predicted Changes			Predicted Change in Correlation	Contribution to Predicted Changes			Predicted Change in Correlation	Contribution to Predicted Changes		
			Trade Integration	Output Specialization	Demand Spillovers		Trade Integration	Export Specialization	Demand Spillovers		Trade Integration	Import Specialization	Demand Spillovers
I. Latin America and the Caribbean													
Latin America & the Caribbean	0.280	**0.151**	0.021	0.031	0.099	**0.112**	0.050	-0.014	0.076	**0.157**	0.105	-0.022	0.074
Central America and the Caribbean	-0.042	**0.146**	0.014	0.033	0.099	**0.107**	0.034	-0.003	0.076	**0.080**	0.071	-0.065	0.074
South America	0.297	**0.123**	0.019	0.005	0.099	**0.106**	0.036	-0.006	0.076	**0.113**	0.064	-0.025	0.074
- Andean Countries	0.491	**0.142**	0.027	0.016	0.099	**0.114**	0.051	-0.013	0.076	**0.112**	0.090	-0.052	0.074
- Southern Cone	0.160	**0.123**	0.021	0.003	0.099	**0.120**	0.037	0.007	0.076	**0.115**	0.043	-0.003	0.074
II. Selected LAC Countries													
Argentina	-0.202	**0.122**	0.013	0.010	0.099	**0.099**	0.024	-0.001	0.076	**0.118**	0.041	0.002	0.074
Belize	-0.171	**0.085**	0.001	-0.015	0.099	**0.120**	0.002	0.042	0.076	**0.075**	0.005	-0.004	0.074
Brazil	0.147	**0.084**	0.019	-0.034	0.099	**0.103**	0.031	-0.004	0.076	**0.201**	0.047	0.080	0.074
Chile	0.483	**0.143**	0.011	0.033	0.099	**0.088**	0.026	-0.015	0.076	**0.100**	0.052	-0.026	0.074
Colombia	1.039	**0.074**	0.031	-0.056	0.099	**0.116**	0.064	-0.024	0.076	**0.122**	0.122	-0.074	0.074
Costa Rica	-0.575	**0.125**	0.042	-0.017	0.099	**0.130**	0.089	-0.036	0.076	**0.124**	0.172	-0.122	0.074
Dominican Rep.	-1.221	**0.224**	0.016	0.108	0.099	**0.113**	0.038	0.000	0.076	**0.082**	0.077	-0.069	0.074
Ecuador	0.488	**0.070**	0.030	-0.059	0.099	**0.115**	0.068	-0.030	0.076	**0.104**	0.139	-0.109	0.074
Guatemala	-0.154	**0.096**	0.031	-0.034	0.099	**0.118**	0.072	-0.031	0.076	**0.108**	0.152	-0.118	0.074
Guyana	-0.414	**0.053**	0.006	-0.053	0.099	**0.067**	0.015	-0.024	0.076	**0.075**	0.032	-0.030	0.074
Honduras	-0.161	**0.187**	0.018	0.070	0.099	**0.111**	0.039	-0.004	0.076	**0.076**	0.079	-0.076	0.074
Haiti	-0.015	**0.111**	0.000	0.011	0.099	**0.107**	0.001	0.030	0.076	**0.073**	0.002	-0.003	0.074
Jamaica	0.983	**0.109**	0.013	-0.003	0.099	**0.107**	0.033	-0.003	0.076	**0.053**	0.073	-0.095	0.074
Mexico	-0.349	**0.135**	0.038	-0.002	0.099	**0.118**	0.075	-0.033	0.076	**0.148**	0.130	-0.056	0.074
Nicaragua	0.025	**0.138**	-0.015	0.053	0.099	**0.075**	-0.028	0.027	0.076	**0.068**	-0.052	0.046	0.074
Panama	-0.050	**0.184**	0.012	0.073	0.099	**0.095**	0.027	-0.009	0.076	**0.051**	0.057	-0.080	0.074
Peru	0.391	**0.191**	0.008	0.083	0.099	**0.099**	0.014	0.008	0.076	**0.113**	0.023	0.015	0.074
Paraguay	0.740	**0.108**	0.015	-0.007	0.099	**0.104**	0.040	-0.012	0.076	**0.072**	0.087	-0.089	0.074
El Salvador	-0.265	**0.186**	0.038	0.049	0.099	**0.134**	0.092	-0.034	0.076	**0.105**	0.193	-0.163	0.074
Suriname	0.581	**0.209**	0.017	0.093	0.099	**0.117**	0.050	-0.009	0.076	**0.069**	0.111	-0.117	0.074
Trinidad & Tobago	0.892	**0.194**	0.005	0.089	0.099	**0.102**	0.011	0.015	0.076	**0.078**	0.020	-0.016	0.074
Uruguay	-0.090	**0.081**	0.005	-0.023	0.099	**0.106**	0.001	0.029	0.076	**0.082**	-0.012	0.019	0.074
Venezuela	0.046	**0.232**	0.038	0.095	0.099	**0.125**	0.055	-0.007	0.076	**0.109**	0.074	-0.039	0.074

Table 9
Explaining Changes in Output Correlation for Latin America and the Caribbean vis-à-vis India
Changes in the period 1995-2004 relative to the period 1985-94

	Actual Correlation Change	ASP Model: Equation [4] of Table 6				ASX Model: Equation [5] of Table 6				ASM Model: Equation [6] of Table 6			
		Predicted Change in Correlation	Contribution to Predicted Changes			Predicted Change in Correlation	Contribution to Predicted Changes			Predicted Change in Correlation	Contribution to Predicted Changes		
			Trade Integration	Output Specialization	Demand Spillovers		Trade Integration	Export Specialization	Demand Spillovers		Trade Integration	Import Specialization	Demand Spillovers
I. Latin America and the Caribbean													
Latin America & the Caribbean	0.134	**0.232**	0.019	0.050	0.163	**0.157**	0.042	-0.013	0.128	**0.126**	0.084	-0.085	0.127
Central America and the Caribbean	0.175	**0.223**	0.016	0.044	0.163	**0.155**	0.038	-0.011	0.128	**0.123**	0.079	-0.083	0.127
South America	0.114	**0.242**	0.021	0.058	0.163	**0.157**	0.045	-0.016	0.128	**0.127**	0.087	-0.088	0.127
- Andean Countries	0.015	**0.238**	0.019	0.056	0.163	**0.153**	0.045	-0.019	0.128	**0.128**	0.094	-0.093	0.127
- Southern Cone	0.213	**0.246**	0.023	0.059	0.163	**0.161**	0.045	-0.012	0.128	**0.127**	0.081	-0.082	0.127
II. Selected LAC Countries													
Argentina	1.156	**0.256**	0.018	0.075	0.163	**0.146**	0.043	-0.025	0.128	**0.114**	0.092	-0.105	0.127
Bolivia	-0.099	**0.234**	0.014	0.058	0.163	**0.166**	0.033	0.006	0.128	**0.125**	0.068	-0.071	0.127
Brazil	-0.246	**0.273**	0.038	0.072	0.163	**0.179**	0.053	-0.002	0.128	**0.140**	0.061	-0.048	0.127
Chile	-0.076	**0.214**	0.018	0.032	0.163	**0.146**	0.044	-0.026	0.128	**0.126**	0.092	-0.094	0.127
Colombia	-0.203	**0.206**	0.008	0.034	0.163	**0.138**	0.019	-0.009	0.128	**0.115**	0.040	-0.052	0.127
Costa Rica	0.416	**0.177**	0.023	-0.010	0.163	**0.165**	0.056	-0.019	0.128	**0.130**	0.117	-0.115	0.127
Dominican Rep.	-0.736	**0.223**	0.007	0.053	0.163	**0.153**	0.017	0.008	0.128	**0.122**	0.035	-0.040	0.127
Ecuador	-0.584	**0.258**	0.059	0.036	0.163	**0.187**	0.138	-0.079	0.128	**0.143**	0.289	-0.273	0.127
Guatemala	-0.419	**0.229**	0.019	0.046	0.163	**0.153**	0.045	-0.019	0.128	**0.132**	0.095	-0.090	0.127
Guyana	0.545	**0.096**	0.017	-0.084	0.163	**0.129**	0.040	-0.039	0.128	**0.122**	0.084	-0.089	0.127
Honduras	-0.348	**0.225**	0.024	0.038	0.163	**0.172**	0.056	-0.012	0.128	**0.123**	0.119	-0.123	0.127
Jamaica	0.069	**0.308**	0.011	0.134	0.163	**0.153**	0.026	-0.001	0.128	**0.131**	0.055	-0.052	0.127
Mexico	-0.106	**0.241**	0.039	0.039	0.163	**0.173**	0.063	-0.018	0.128	**0.143**	0.092	-0.077	0.127
Nicaragua	0.905	**0.211**	-0.001	0.049	0.163	**0.151**	-0.003	0.026	0.128	**0.123**	-0.005	0.001	0.127
Panama	0.709	**0.268**	0.033	0.071	0.163	**0.166**	0.076	-0.038	0.128	**0.063**	0.158	-0.222	0.127
Peru	0.548	**0.263**	0.014	0.086	0.163	**0.152**	0.034	-0.010	0.128	**0.133**	0.073	-0.068	0.127
Paraguay	-0.454	**0.249**	0.019	0.066	0.163	**0.162**	0.042	-0.007	0.128	**0.120**	0.084	-0.091	0.127
El Salvador	0.393	**0.212**	0.025	0.024	0.163	**0.166**	0.059	-0.020	0.128	**0.147**	0.123	-0.103	0.127
Suriname	-0.512	**0.274**	0.019	0.092	0.163	**0.160**	0.039	-0.008	0.128	**0.134**	0.078	-0.071	0.127
Trinidad & Tobago	0.906	**0.233**	0.003	0.067	0.163	**0.137**	0.007	0.002	0.128	**0.129**	0.014	-0.012	0.127
Uruguay	0.683	**0.236**	0.022	0.051	0.163	**0.171**	0.042	0.001	0.128	**0.133**	0.078	-0.073	0.127
Venezuela	0.412	**0.228**	0.001	0.064	0.163	**0.123**	0.000	-0.004	0.128	**0.123**	-0.002	-0.003	0.127

Figure 1
Output Co-Movement: 10-Year Window Rolling Correlations

1.1 LAC Sub-Regions vis-à-vis CHINA



1.2 LAC Sub-Regions vis-à-vis INDIA

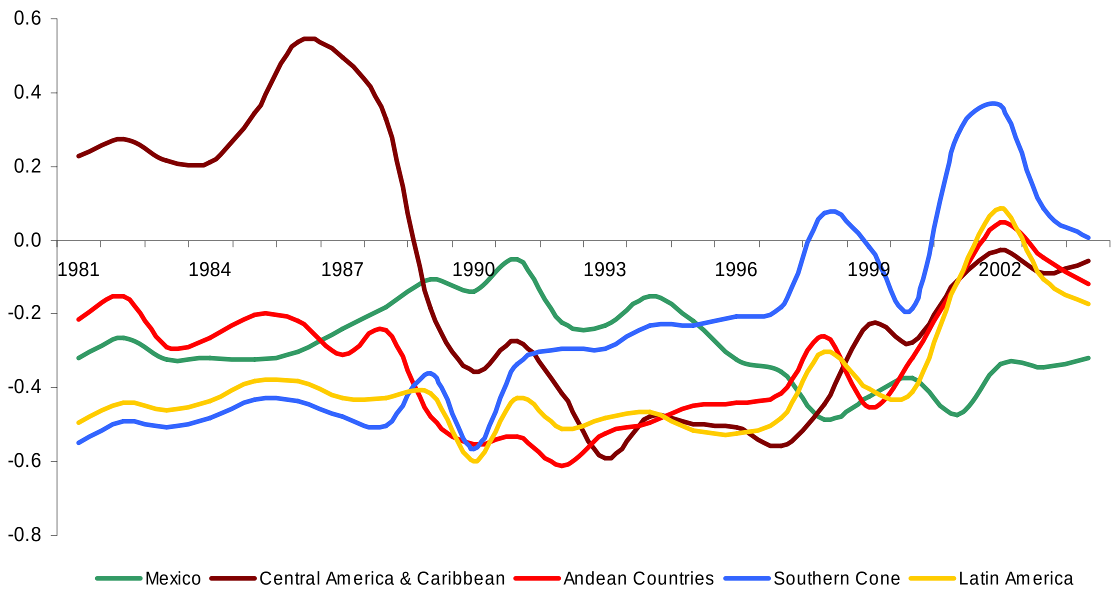
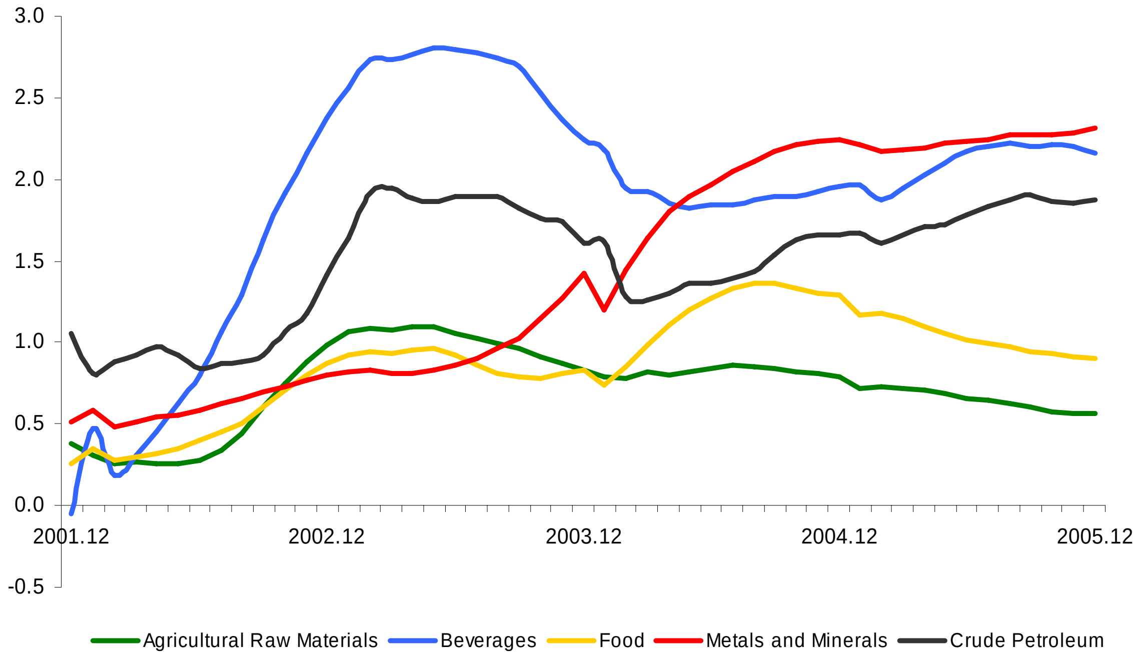


Figure 2
China and India: Impact on Commodity Prices

2.1 Industrial Production in China vs. World Commodity Price Indices



2.2 Industrial Production in India vs. World Commodity Price Indices

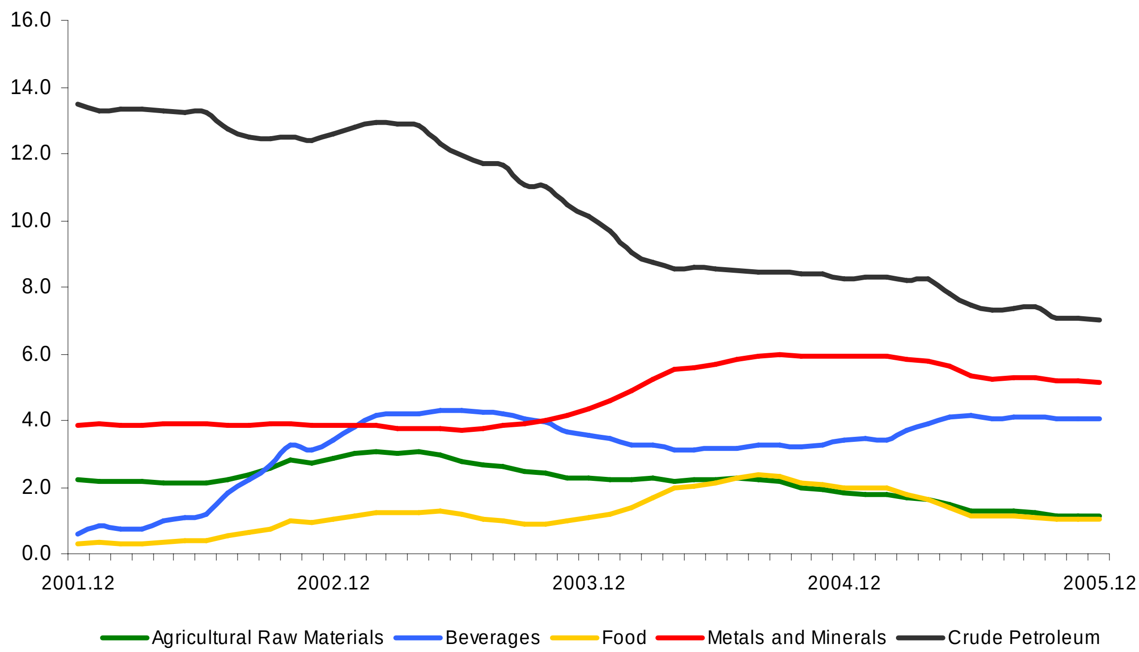
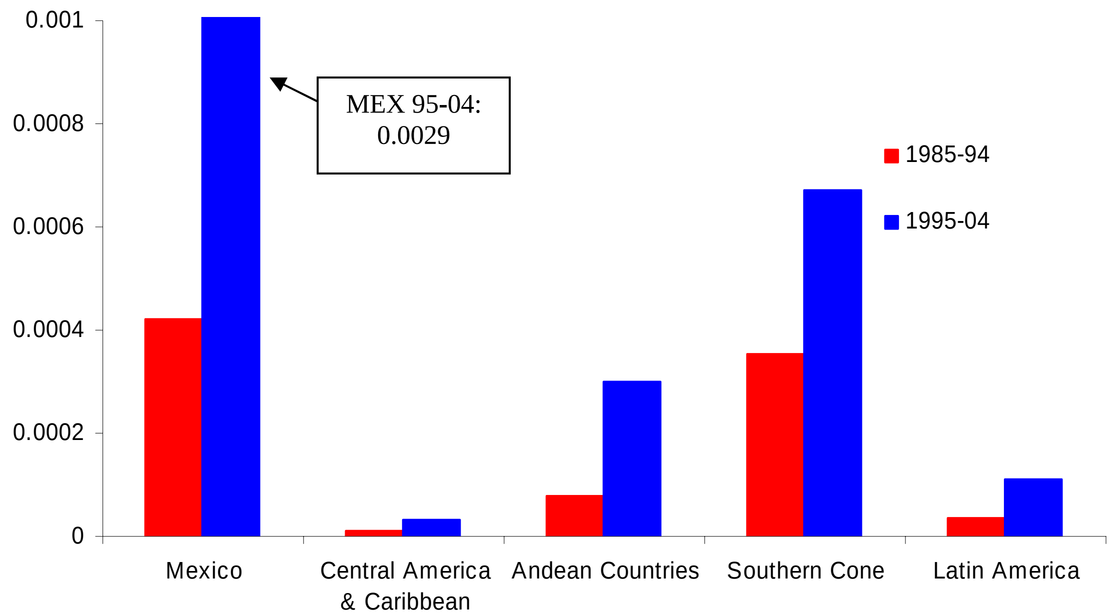


Figure 3
Trade Integration of Latin America with China and India

3.1 LAC Sub-Regions vis-à-vis CHINA



3.2 LAC Sub-Regions vis-à-vis INDIA

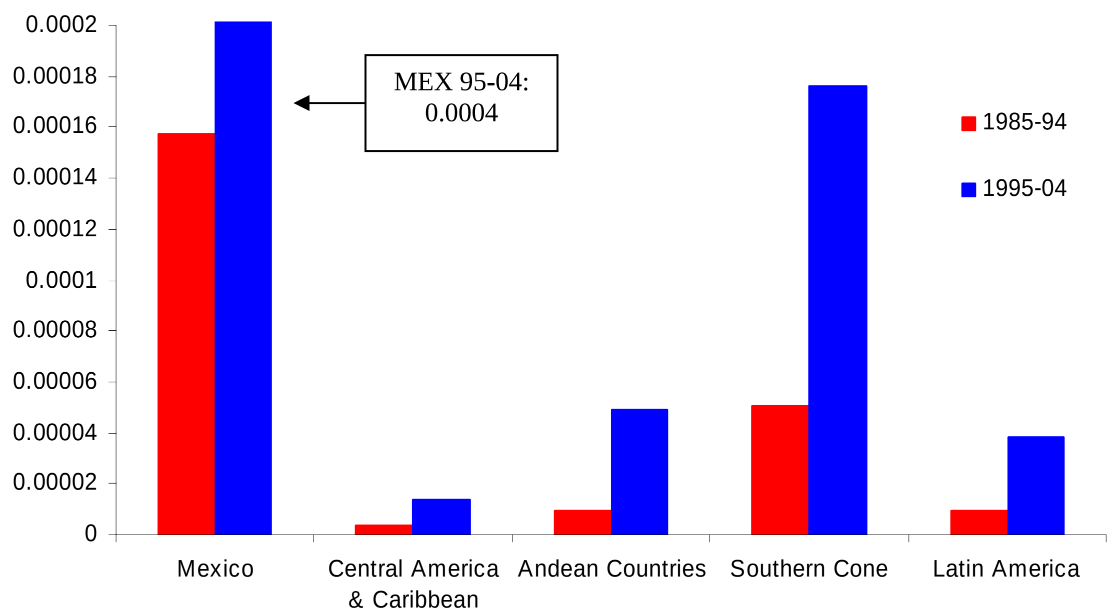
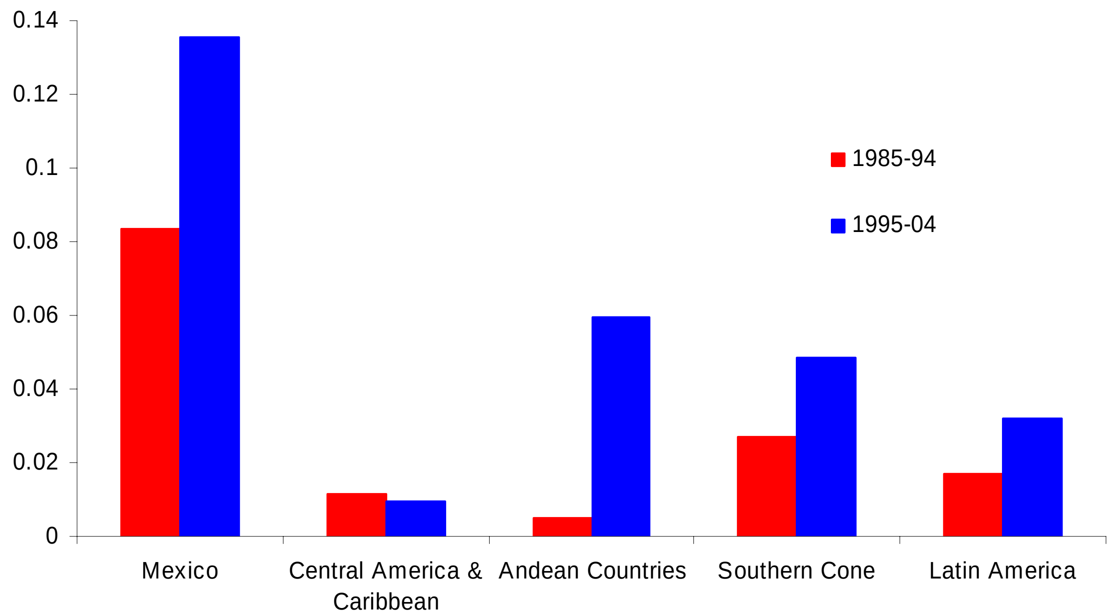


Figure 4
Intra-Industry Trade inLatin America with China and India

4.1 LAC Sub-Regions vis-à-vis CHINA



4.2 LAC Sub-Regions vis-à-vis INDIA

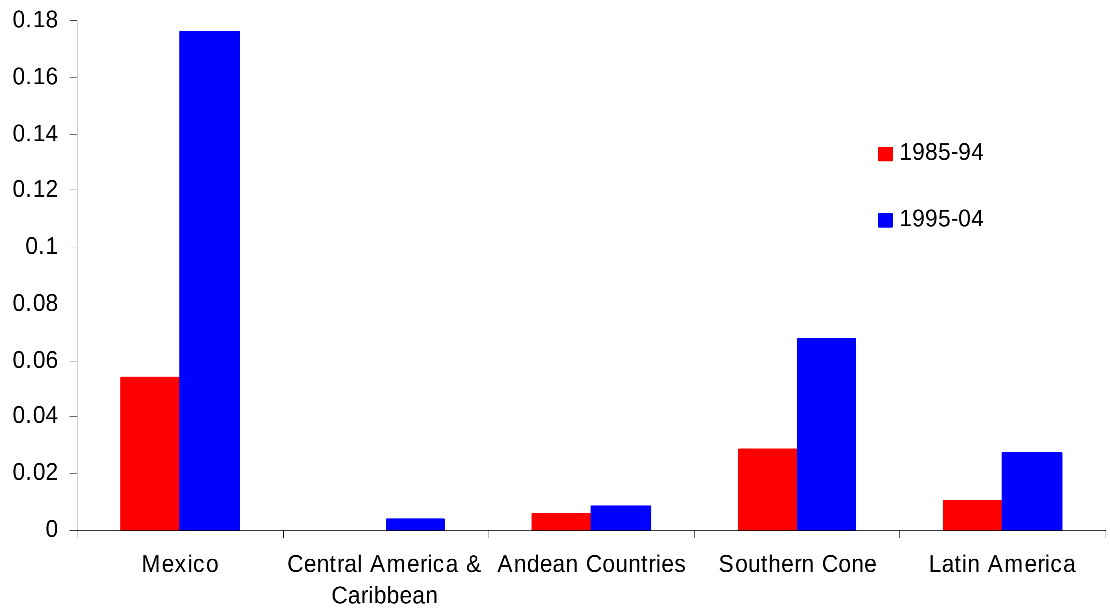
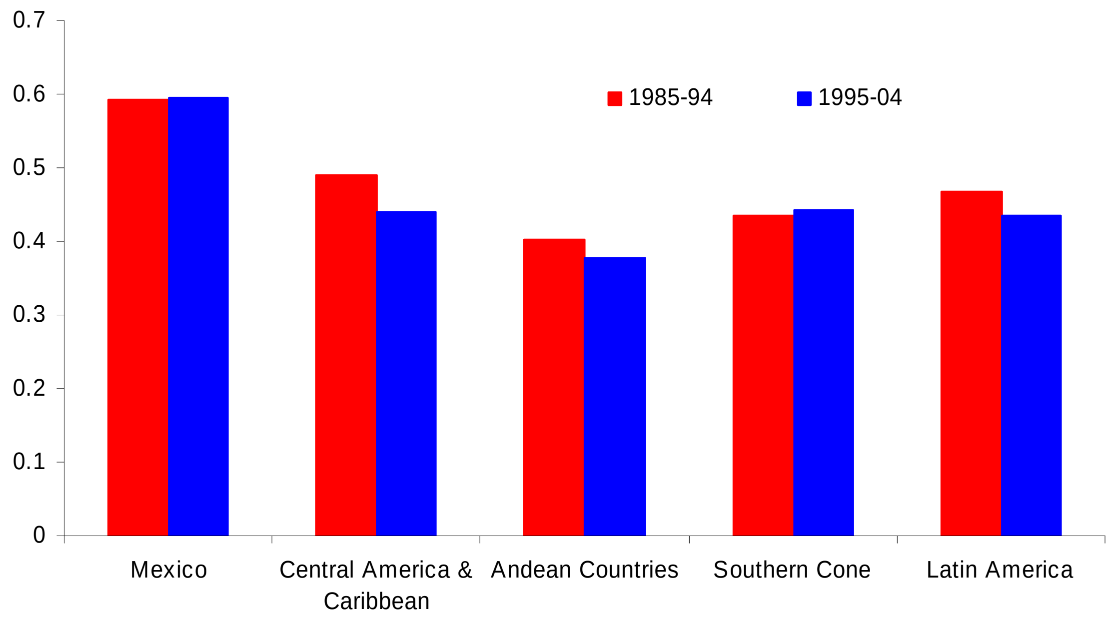


Figure 5
Asymmetries in Production Structures in Latin America relative to China and India

5.1 LAC Sub-Regions vis-à-vis CHINA



5.2 LAC Sub-Regions vis-à-vis INDIA

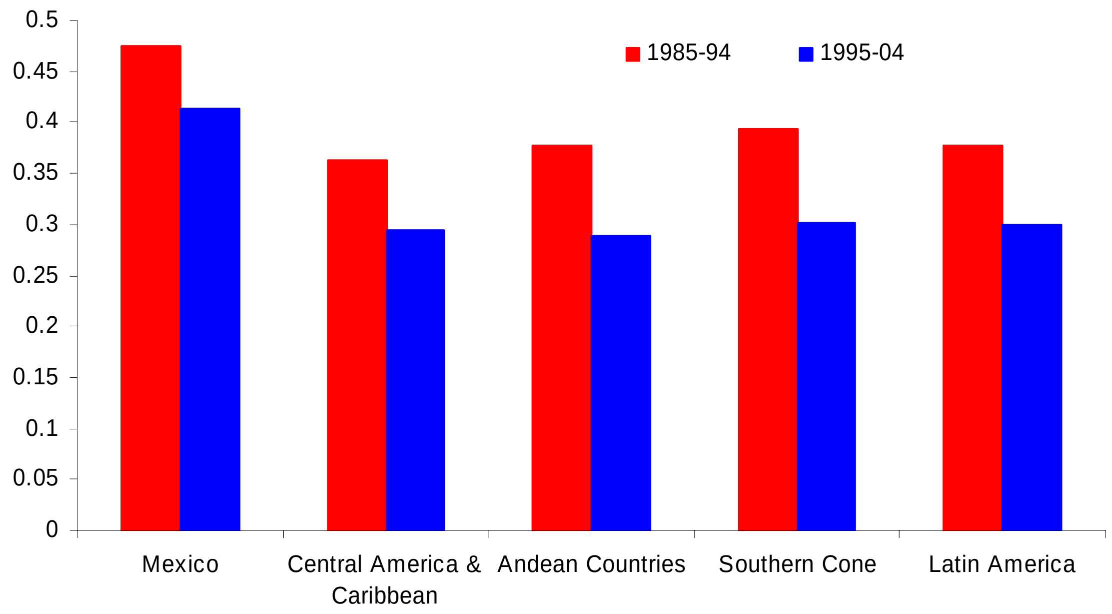
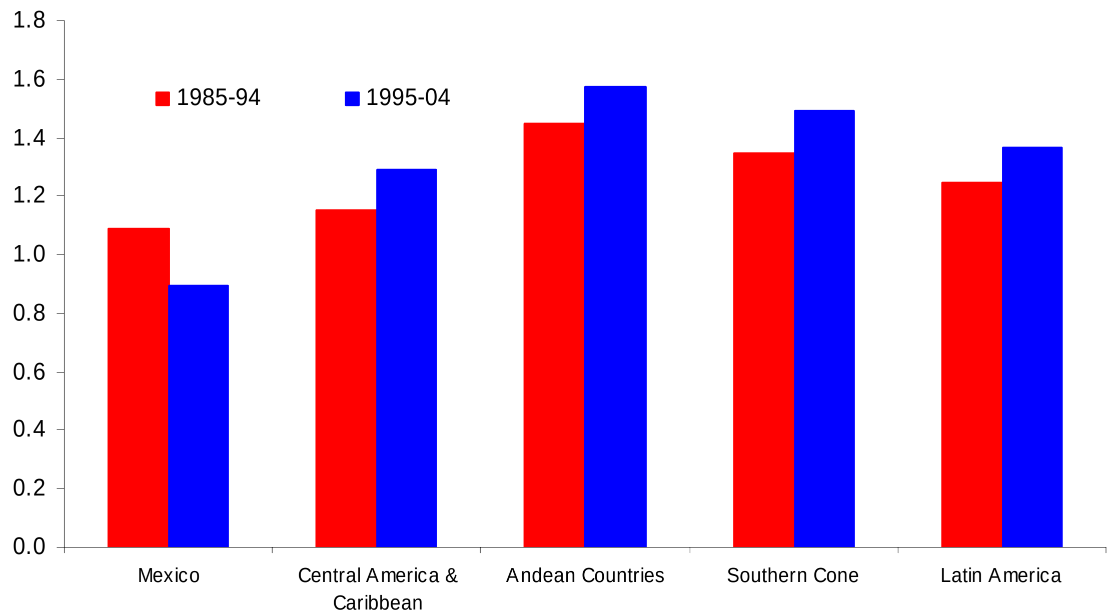


Figure 6
Asymmetries in the Structure of Exports
in Latin America relative to China and India

6.1 LAC Sub-Regions vis-à-vis CHINA



6.2 LAC Sub-Regions vis-à-vis INDIA

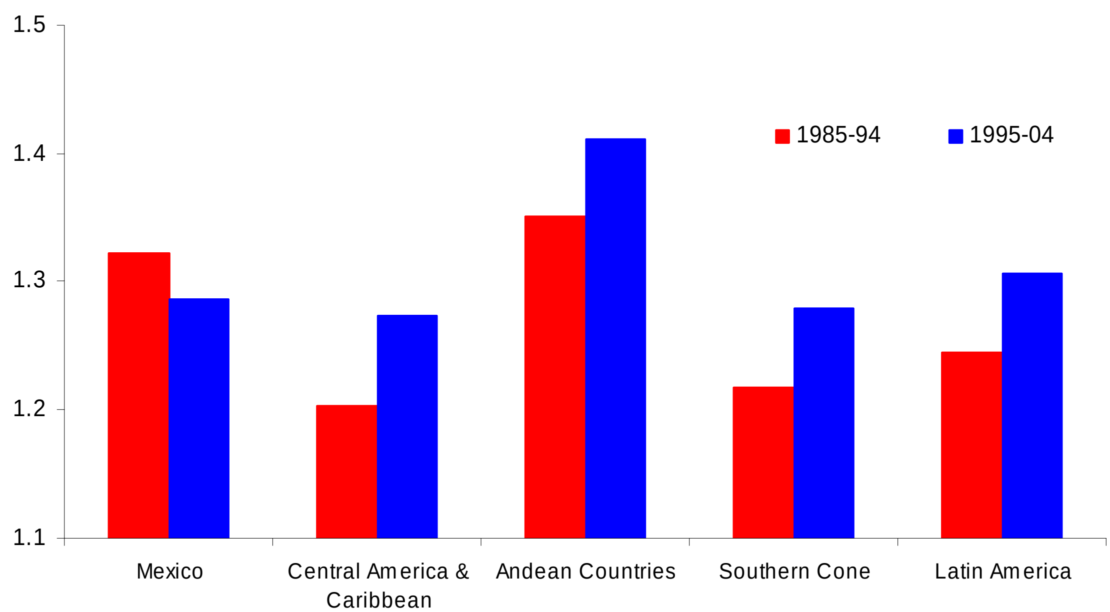
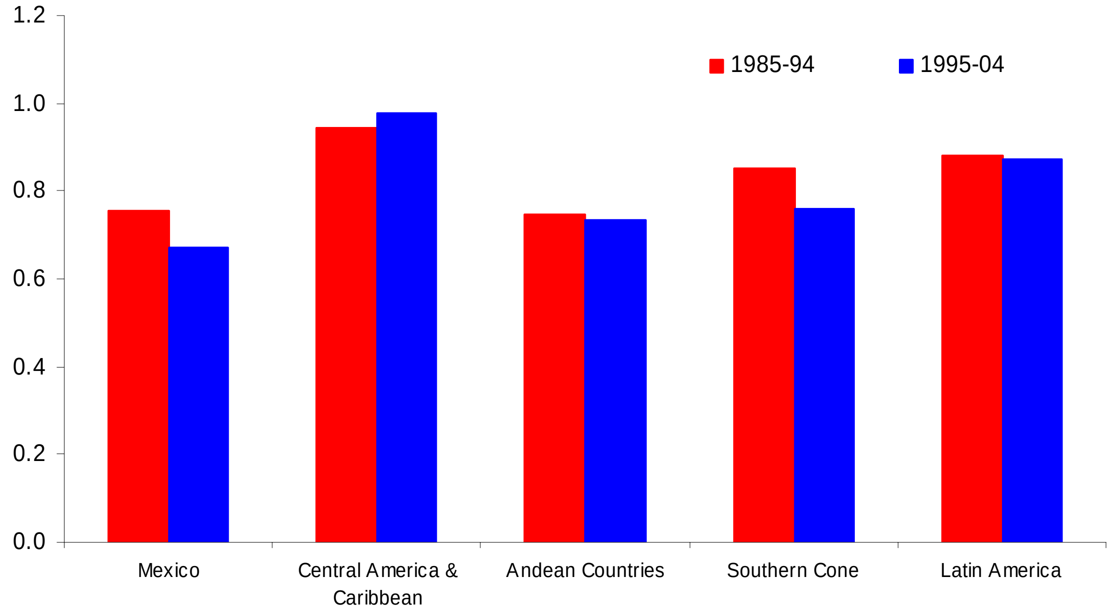


Figure 7
Asymmetries in the Structure of Imports in Latin America relative to China and India

7.1 LAC Sub-Regions vis-à-vis CHINA



7.2 LAC Sub-Regions vis-à-vis INDIA

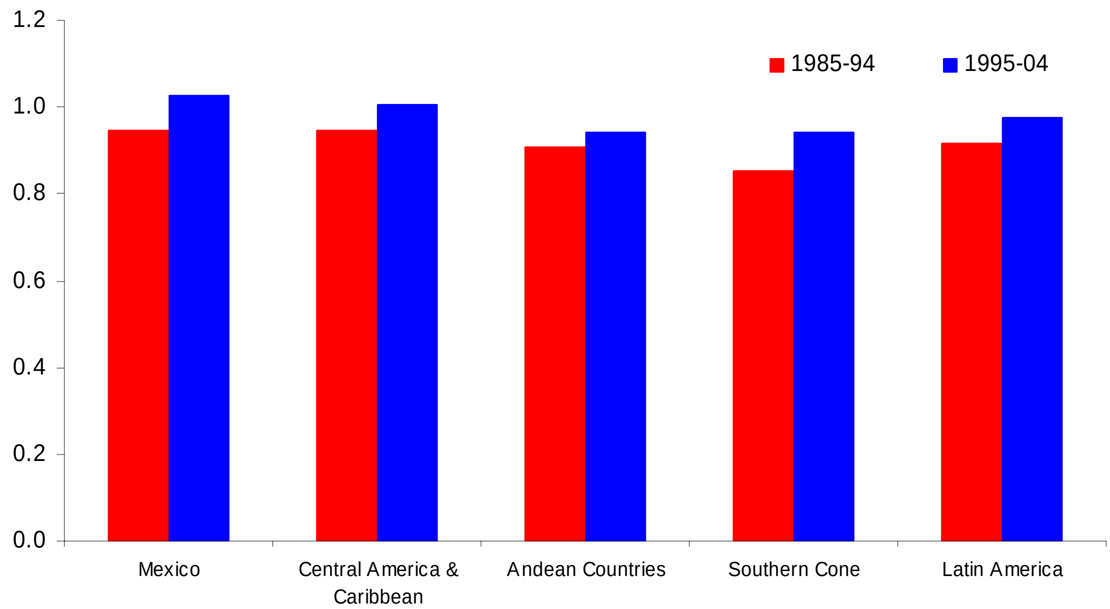
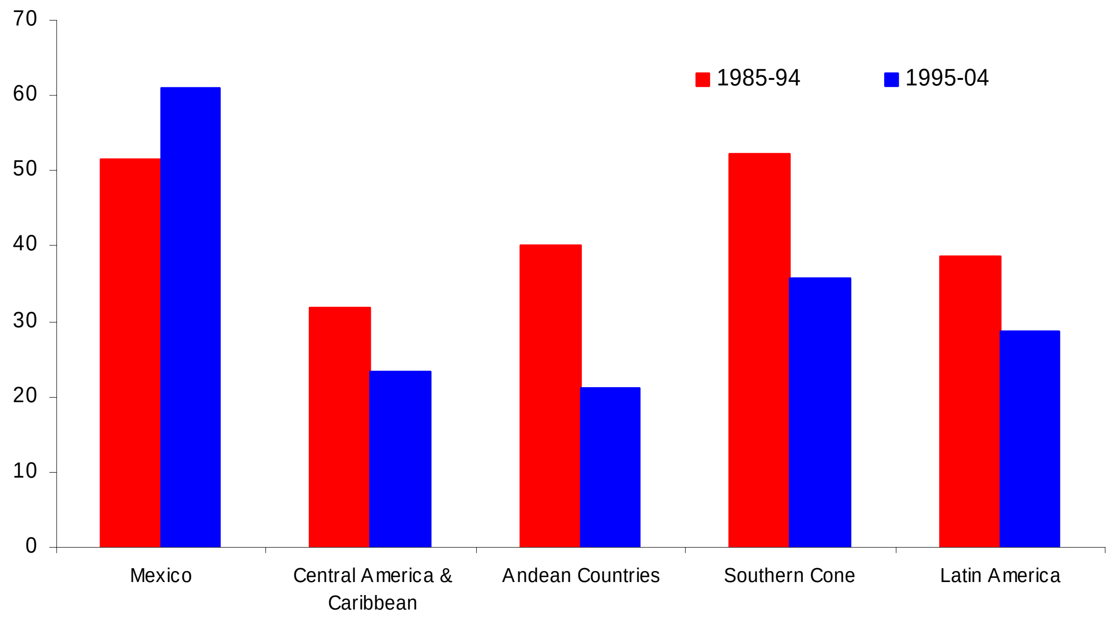


Figure 8
Export Similarity Index between Latin America, India and China with respect to the US market

8.1 LAC Sub-Regions vis-à-vis CHINA



8.2 LAC Sub-Regions vis-à-vis INDIA

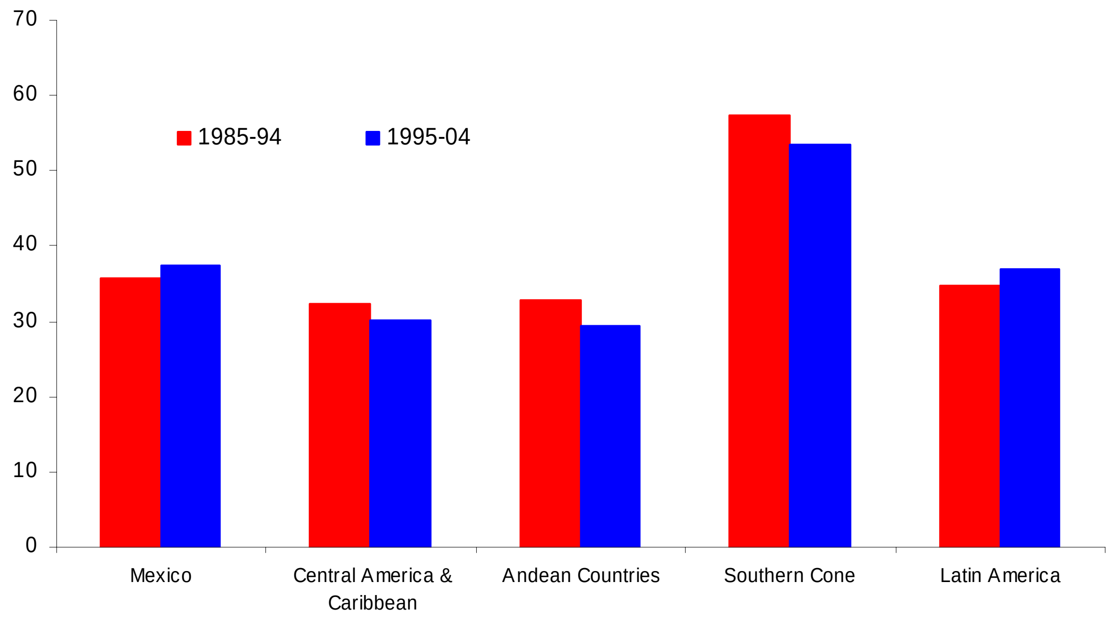
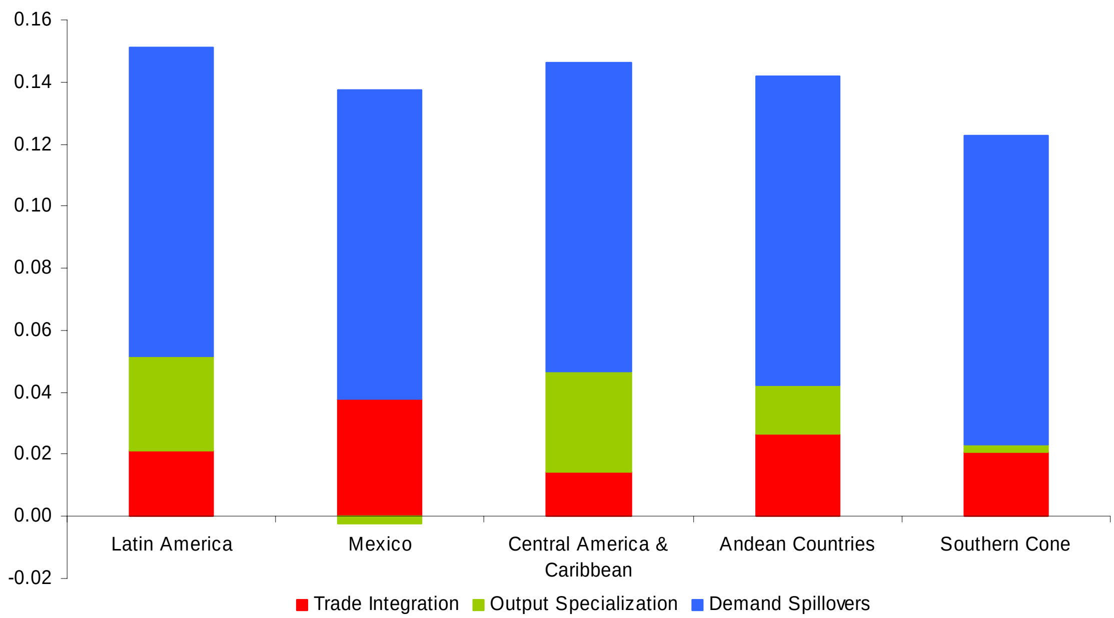
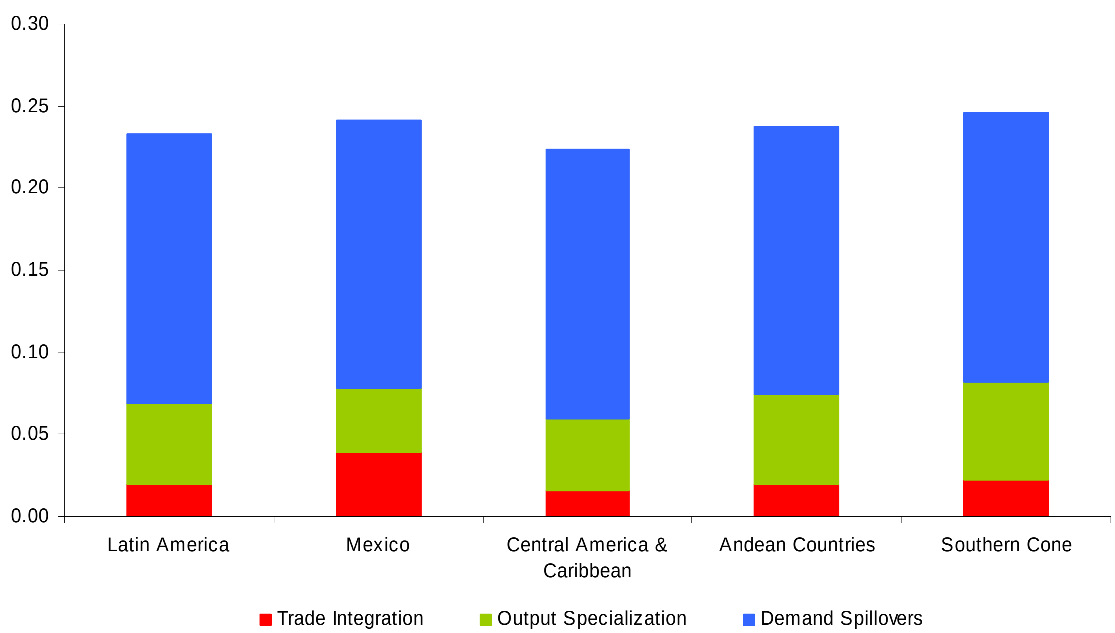


Figure 9
Contribution of Trade, Specialization and Demand Spillovers to Predicted Changes in Output Correlation, 1995-2004 vs. 1985-1994

9.1 LAC Sub-Regions vis-à-vis CHINA



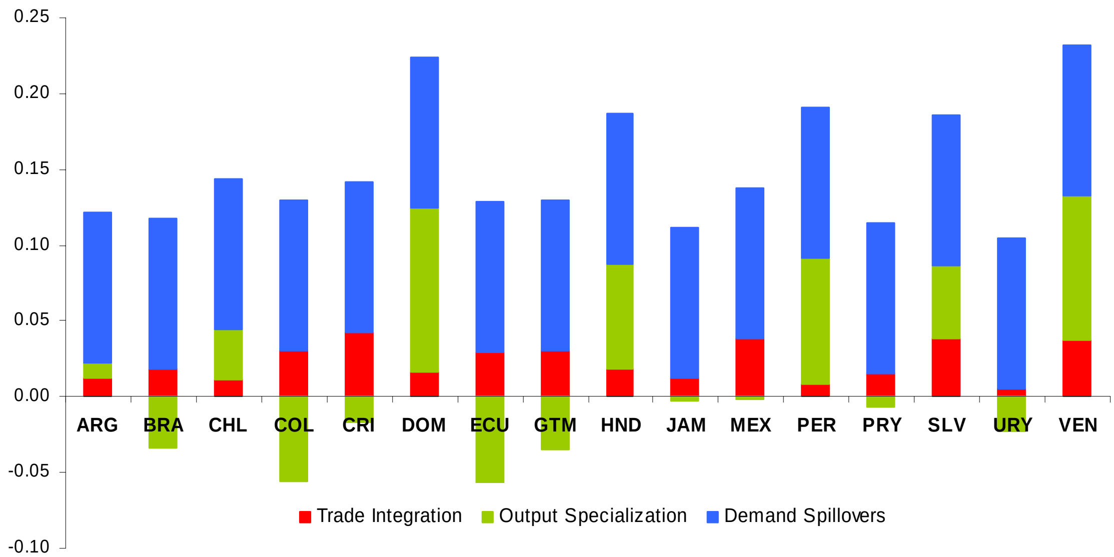
9.2 LAC Sub-Regions vis-à-vis INDIA



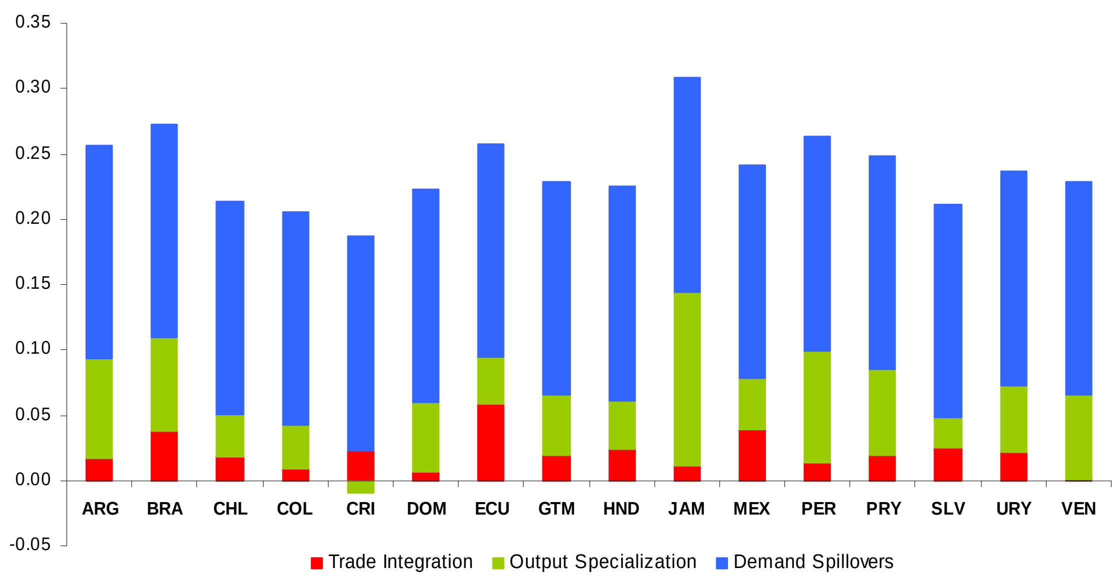
Note: Our decompositions use the regression estimates of column [4] in Table 6.

Figure 10
Contribution of Trade, Specialization and Demand Spillovers to Predicted Changes in Output Correlation, 1995-2004 vs. 1985-1994
Evidence for Selected Latin American Countries

10.1 Selected LAC Countries vis-à-vis CHINA



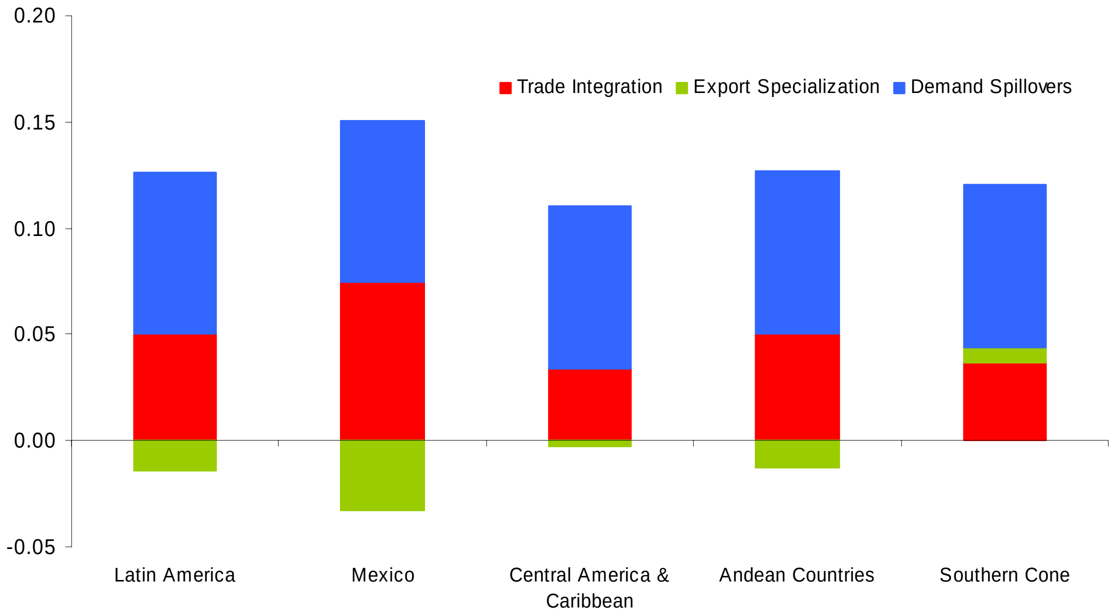
10.2 Selected LAC Countries vis-à-vis INDIA



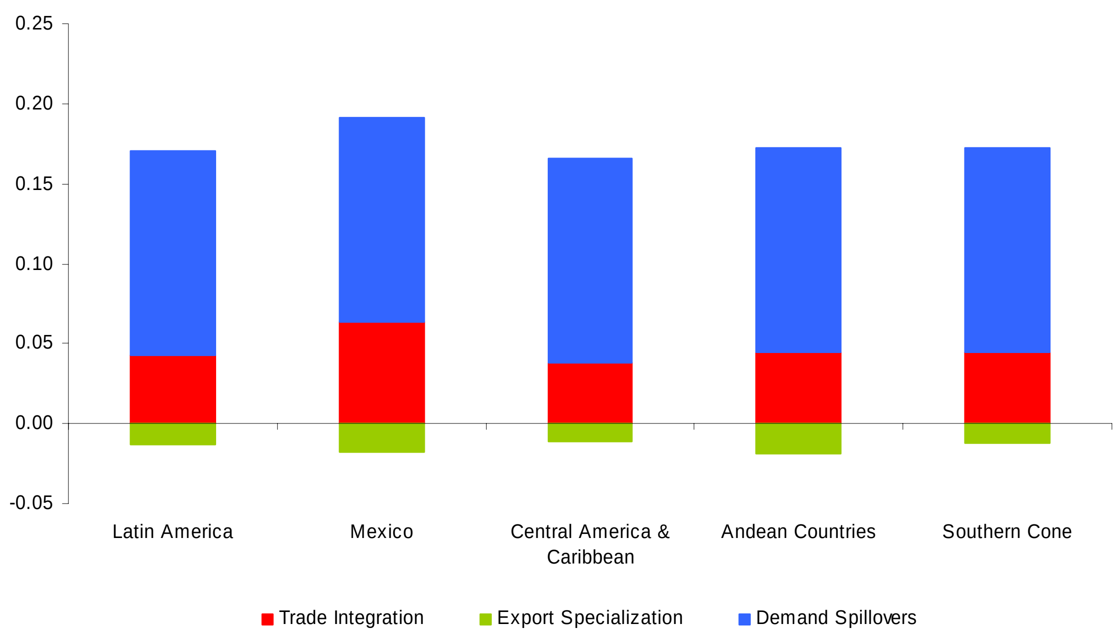
Note: Our decompositions use the regression estimates of column [4] in Table 6.

Figure 11
Contribution of Trade, Export Specialization and Demand Spillovers to Predicted Changes in Output Correlation, 1995-2004 vs. 1985-1994

11.1 LAC Sub-Regions vis-à-vis CHINA



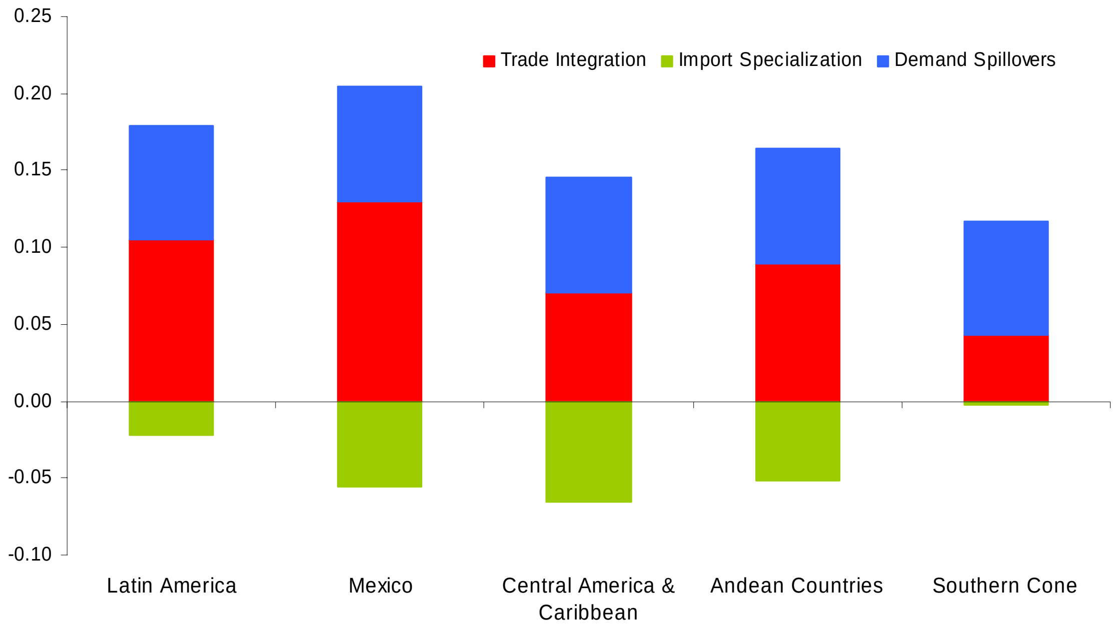
11.2 LAC Sub-Regions vis-à-vis INDIA



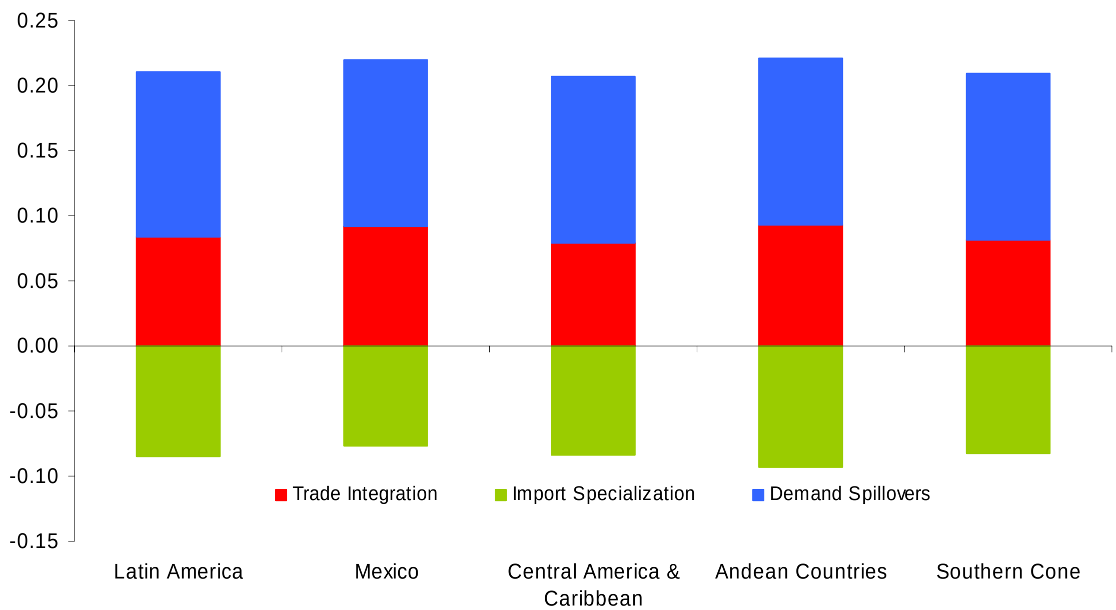
Note: Our decompositions use the regression estimates of column [5] in Table 6.

Figure 12
Contribution of Trade, Import Specialization and Demand Spillovers to Predicted Changes in Output Correlation, 1995-2004 vs. 1985-1994

12.1 LAC Sub-Regions vis-à-vis CHINA



12.2 LAC Sub-Regions vis-à-vis INDIA



Note: Our decompositions use the regression estimates of column [6] in Table 6.