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Comovements and Sectoral Interdependence: Evidence for Latin America, East Asia, and Europe

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This paper analyzes common economic patterns across countries and economic sectors in Latin America, East Asia, and Europe for the period 1970–94 by means of an error-components model that decomposes real value-added growth in each country into common international effects, sector-specific effects, and country-specific effects. We find significant comovements in the European and East Asian samples. In the Latin American sample, however, we find country-specific components to be more important than common patterns. These results are robust to different sub-sample time spans and different sub-sample country groups. [JEL E32]

The term international comovement refers to the existence of common short-run and long-run patterns in aggregate economic behavior across countries. The study of comovement, or integration, is important because its results can guide policy in an era of globalization. Although international openness to trade and capital flows provides well known economic benefits, it also increases the vulnerability of a country to international shocks. Thus, in a region where integration is substantial, the need to monitor international economic development are correspondingly high. Furthermore, substantial integration calls for both policy coordi-

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nation among national authorities to handle external shocks and regional (rather than country-specific) policies by international organizations. One particular policy that can be guided by the results of a study on comovement is exchange rate coordination: to the extent that countries are primarily affected by common shocks, having a single currency (or more generally, a rigid exchange rate arrangement) could be an appropriate policy.

Similarities in economic fluctuations in a group of countries can be accounted for by several distinct factors. First, comovement may arise from country-specific shocks that are rapidly transmitted to other countries. This transmission can occur either via current account transactions (that is, changing the volume and price of traded goods) or through capital markets (that is, provoking a reaction in domestic capital markets); see Goldfajn and Valdes (1997), Frankel and Schmukler (1996), and Levy-Yeyati and Ubide (2000), among many others. In both cases, if the speed of transmission is relatively fast, we would expect to observe a synchronized comovement in output among the countries involved rather than a lead-lag type of relationship, particularly when output data are given at low frequency (annually, for instance).

A second source of commonality in aggregate economic variables is the existence of shocks that affect all countries in a similar fashion. Both Dellas (1986) and Fabrizio and Lopez (1996) conclude that the main source of commonality in output fluctuations is due to this second source. This result must be regarded with caution given the difficulty of distinguishing rapidly transmitted shocks from externally produced common shocks. As an example, consider the effects of the 1997 East Asian crisis on Brazil. Although the East Asian region absorbs only about 10 percent of Brazilian exports, the real was put under heavy pressure in late 1997, and the Brazilian authorities had to double interest rates and announce a tight fiscal package that had negative short-run effects on Brazilian output. Given the fast policy response of the Brazilian authorities, the effects of the East Asian crisis on output of both East Asian countries and Brazil could be considered, ex post, as highly synchronized.

A third source of commonality in aggregate output arises from shocks specific to a sector of the economy. For example, if a technology shock affects a particular economic sector, aggregate output comovement would arise from similarities in the economic structure of the countries involved. Costello (1993) presents evidence for six OECD countries suggesting that short-run productivity growth is similar across industries in a nation but less so across countries in any specific industry. However, Marimon and Zilibotti (1998) studying sectoral employment and labor costs in 11 European countries conclude that sectoral effects are more important than country-specific effects in the long run and equally important in the short run. Bayoumi and Prasad (1997) analyze 1-digit output data for U.S. states and European countries and find that both areas are subject to similar overall disturbances, with better labor market adjustment in the United States.

Until recently, most of the empirical research on these issues has concentrated on OECD countries and little is known about the relative importance of domestic and common shocks in other countries and regions. This paper contributes to the literature by presenting evidence on the importance of country-specific, sector-

specific, and common shocks for a group of Latin American, European, and East Asian countries. Given that we use as a measure of integration the proportion of variability in output growth rates explained by country-independent factors, working with different regions gives us a benchmark against which to evaluate our results. Otherwise, the results would be difficult to interpret: is a country-specific component of 50 percent high or low?[1] A second contribution of the paper is that we work with real value added in agriculture, industry, and services. By using sectoral data, we can capture a wealth of cyclical information that would simply cancel out when using aggregate data. Moreover, taking into account not only industrial production but also agriculture and services is especially important in a developing country context, where industry accounts for less than 40 percent of GDP. To the best of our knowledge, this is the first time that international comovement for developing countries has been analyzed at the sectoral level. Previous research has either concentrated on developed countries (Costello, 1993; Norrbin and Schlagenhauf, 1996; Bayoumi and Prasad, 1997; and Funke, Hall, and Ruhwedel, 1999) and used aggregate output data (Dellas, 1986; Canova and Dellas, 1993; Fabrizio and Lopez, 1996; and Canova and Marrinan, 1998); used industrial production indices (Artis and Zhang, 1995); or 1-digit sectoral output data (Bayoumi and Prasad, 1997).

The results of our paper show significant short-run and also long-run comovement within Europe and East Asia. In contrast, we find that the variability of output growth in Latin America is mainly explained by country-specific components. These results are robust to different sub-sample time spans and different sub-sample country groups. Finally, in terms of the degree of comovement across countries, we find the East Asian countries to be good candidates for a currency area similar to the European one.

We acknowledge two limitations in our analysis. First, we do not explicitly consider the possibility of transmission of shocks involving lags of more than one year (the frequency of our data). As noted above, however, the existing empirical evidence suggests either a small role for transmitted shocks or a fast transmission (in less than a year). In this regard, what we will identify as common shocks may be a combination of strictly speaking common shocks and rapidly transmitted shocks. Although disentangling common shocks from transmitted shocks might be important in order to give an economic interpretation to the sources of international business cycles, the fact that we are not attempting to test any particular model makes the differentiation less relevant. Besides, from a policy perspective, common and rapidly transmitted shocks are likely to be treated similarly.

The second limitation of our work is that, owing to data constraints, our analysis focuses on the period 1970–94, thus missing the most recent years. This limitation may be important because of the rapid pace of integration that the world economies have experienced during the second half of the 1990s. As noted by the

[1]Bayoumi and Prasad (1997) use the degree of comovement among United States regions as a benchmark. As they point out, however, the comparison is not completely fair because of the unified language and cultural heritage of the United States, and the fact that the United States has operated as a currency area for over 200 years.

World Bank (1997), private capital flows to developing countries were nearly six times greater in 1996 than they were at the start of the decade, and the share of foreign direct investment in total capital flows in 1996 was almost three times greater than in 1990. Moreover, foreign investment in 1996 represented almost 20 percent of domestic investment compared to around 5 percent in 1990. Hence, our analysis may underestimate the degree of integration of the economies under consideration.

I. A Statistical Model

The economic performance of a country may be decomposed into country-specific factors, such as factor endowments, market organization, political rights, or economic policies; sector-specific factors, such as commodity-price or technology shocks; and common factors affecting all sectors and countries in a similar fashion, such as a major financial crisis. In this section we present an error components model that will allow us to gauge which fraction of annual real value-added growth in a given country can be attributed to each of these effects. This decomposition will be performed at the level of the basic areas of economic activity, namely, agriculture, industry, and services. The model we employ is similar to the one used by Stockman (1988) and Costello (1993) to analyze productivity dynamics in the OECD, by Bayoumi and Prasad (1997) to study currency area properties in Europe, and by Marimon and Zilibotti (1998) to study European employment dynamics. Formally, we assume that the real value-added growth rate in country j and in sector i can be decomposed as the sum of the following components:

$$y(i,j,t) = h(i) + b(t) + f(i,t) + m(i,j) + g(j,t) + u(i,j,t) \qquad (1)$$

for sector $i = 1, 2,..., I$, country $j = 1, 2,..., N$ and time = 1, 2,..., T, where

- $y(i, j, t)$ is the growth rate of sector i, in country j at time t.
- $h(i)$ is a time-invariant component specific for sector i but common to all countries. It would capture the mean growth rate across countries in sector i and represent the international trend in sectoral growth rates.
- $m(i, j)$ is a time-invariant component capturing deviations across countries from $h(i)$; for example, different initial conditions or comparative advantages due to natural-resources availability.
- $b(t)$ is a time effect common to all countries and sectors. It aims to capture the international business cycle, which affects evenly all countries and sectors.
- $f(i, t)$ captures deviations across time from $h(i)$, and deviations across sectors from $b(t)$; it would capture the diverging cyclical behavior of a particular sector in a country.
- $g(j, t)$ captures country-specific deviations from $b(t)$; for example, transitory national under-performance with respect to the international business cycle resulting from national economic policies.
- $u(i, j, t)$ is an error term orthogonal to all other effects.

The first two components, $h(i)$ and $m(i, j)$, are the long-run common and country-specific components, respectively, whereas $b(t)$, $f(i, t)$ and $g(j, t)$ capture,

respectively, the common, sectoral, and idiosyncratic components at annual frequencies. The interpretation of the error term $u(i, j, t)$ is problematic. On the one hand, it can be considered as part of the country-specific short-run fluctuations. On the other hand, however, it can reflect measurement error of sectoral value-added growth rates and, most importantly, non-linear and aggregation effects. Following the literature, we exclude the error term from our calculations of common vis-à-vis country-specific cyclical fluctuations. At any rate, the relative sizes of common and idiosyncratic *long-run* trends are unaffected by this exclusion.

The model in equation (1) is unidentified because some combinations of the dummy variables are perfectly collinear. There are several alternatives to solve this problem. Stockman (1988) and Costello (1993) choose a country and time period as reference point; then, combinations of the parameters are identified relative to the reference country and time period. However, this identification method makes the results dependent on the country or time period selected as reference point. Alternatively, Bayoumi and Prasad (1997) and Marimon and Zilibotti (1998) assume the identification device that all elements in equation (1) are orthogonal, which implies taking as a reference point not a particular country, industry, or year but instead their respective sample means.

Formally, the restrictions take the form of:

$$\begin{aligned}
&\sum_{j=1}^{N} m(i,j) = 0, i = 1,\mathsf{K}\ ,I \\
&\sum_{i=1}^{I} f(i,t) = 0, t = 1,\mathsf{K}\ ,T \\
&\sum_{t=1}^{T} f(i,t) = 0, i = 1,\mathsf{K}\ ,I \\
&\sum_{j=1}^{N} g(j,t) = 0, t = 1,\mathsf{K}\ ,T \\
&\sum_{t=1}^{T} g(j,t) = 0, j = 1,\mathsf{K}\ ,N \\
&\sum_{t=1}^{T} b(t) = 0
\end{aligned} \qquad (2)$$

that give a set of $2T$ x $2I$ x $2N$ + 1 restrictions. With this set of restrictions, the model is properly identified.

Notice that $h(i)$ would represent the sectoral trends of output. More precisely, $h(i)$ is the unweighted mean over the annual growth rates in sector i. The term $m(i, j)$ would capture the differences between country-specific output growth rates in sector i and the average for the same sector across countries. In turn, $b(t)$ is a common short-run effect affecting homogeneously output growth rates across industries and countries. Since it is assumed to average zero over time, it can be interpreted as common temporal deviations from long-run trends. The term $f(i, t)$ represents sector-specific short-run effects causing temporary deviations from the long-run trend in sector i. For example, a positive value in $f(i, t)$ would indicate

that, at time *t*, sector *i* was above its trend, after controlling for common short-run effects. Finally, $g(j, t)$ represents country-specific effects or national transitory deviations of output growth with respect to the common short-run effect captured by $b(t)$.

II. The Data

We use real valued-added annual data for agriculture, industry, and services for a group of countries of Latin America, East Asia, and Europe. The time period is 1970–94. All the value-added series are given in real 1987 U.S. dollars, and from them, annual growth rates are computed. The Latin American countries in the sample are Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Paraguay, Uruguay, and Venezuela. Peru, one of the largest economies in Latin America, is unfortunately excluded from the sample because of lack of sectoral value-added data. The data source for these countries are various issues of the World Development Indicators (WDI) of the World Bank.

The East Asian countries in the sample are Indonesia, Japan, Korea, Malaysia, Singapore, Thailand, and Taiwan Province of China. The original value-added data for these countries are also given in 1987 U.S. dollars and, from them, we computed annual growth rates. The data are from the WDI, with the exception of Taiwan Province of China, which were obtained from the World Bank's International Economics Department database. The European countries are Austria, Belgium, France, Germany, Italy, and Spain. The data in this case are from the OECD's *Historic Statistics*, which reports sectoral annual growth rates directly.[2]

We first examine the proportion of sectoral production in each country's GDP. This will serve to understand the evolution of each country's production structure and will provide a background to the subsequent business-cycle analysis. This preliminary study cannot be done for the European countries because of lack of homogeneous data for sectoral value-added in levels.

Table 1 shows the proportion of each sector in total GDP for the Latin American countries (LAC), reporting statistics for 1970, 1994, and the average over 1970–94. Table 2 reports each country's GDP as a percentage of regional GDP in 1970, 1994, and the period average, respectively. Inspection of Table 1 suggests important differences in the structure of GDP in the countries of our sample. Paraguay is the country that relies most heavily on agricultural production. On the other extreme, Venezuela is the country that depends the least on agriculture and the most on industry. In between, there are two groups of countries. In the first one, Argentina, Brazil, Chile, and Mexico, the agricultural sector represents slightly less than 10 percent of total output. Across these countries, the contribution of each sector to GDP was similar in 1994, with industry accounting for about 36 percent

[2]The European sample does not include some major countries, such as the United Kingdom or the Nordic countries, because of the lack of homogeneous data. Although some of these data can be found in the countries' national accounts statistics, the ongoing adoption of the ESA95 accounting standard does not yet allow us to obtain homogeneous data for all of these countries.

Table 1. LAC: Sectoral GDP

(In percent of total GDP)

	1970			1994			Mean		
Country	Ag	In	Se	Ag	In	Se	Ag	In	Se
Argentina	08	43	49	08	36	56	08	39	52
Brazil	12	39	49	10	36	55	09	40	51
Chile	08	42	49	08	35	57	08	38	54
Costa Rica	23	23	54	17	27	56	19	27	54
Dominican Republic	28	24	49	15	24	61	20	27	53
Ecuador	23	22	55	15	35	50	15	35	50
El Salvador	22	30	48	16	23	60	21	28	52
Honduras	24	19	57	19	23	58	20	21	59
Mexico	11	35	54	08	37	55	09	36	55
Uruguay	17	36	48	14	29	57	14	35	50
Venezuela	05	52	43	06	43	51	05	42	52
Colombia	21	32	46	17	33	51	19	33	48
Paraguay	33	21	45	27	21	52	29	23	48

Note: Ag: Agriculture; In: Industry; and Se: Services

Table 2. LAC: Distribution of Regional GDP

(In percent)

Country	1970	1994	Mean
Argentina	24	17	18
Brazil	31	39	39
Chile	04	04	03
Costa Rica	01	01	01
Dominican Republic	01	01	01
Ecuador	01	02	02
El Salvador	01	01	01
Honduras	01	01	01
Mexico	20	21	21
Uruguay	02	01	01
Venezuela	10	07	08
Colombia	05	06	05
Paraguay	01	01	01

of GDP, and services, for about 55 percent. The second group, Costa Rica, Dominican Republic, Ecuador, El Salvador, Honduras, Uruguay, and Colombia, presents an economic structure where in 1994 agriculture accounted for 15–20 percent of GDP, and industry for less than 30 percent of GDP (except Ecuador, where industry was 35 percent of GDP). Furthermore, from 1970 to 1994, in this group of countries (again, except Ecuador), the share of the service sector grew by an average of about 7 percentage points, mostly at the expense of agriculture.

Regarding the weight of each country in the region, Table 2 indicates that in 1994 the output of Argentina, Brazil, and Mexico represented three fourths of the regional output. Brazilian GDP alone represents around 40 percent of the regional GDP, whereas the Mexican and Argentine GDPs represent around 21 and 17 percent, respectively. Note that the exclusion of Peru from the sample produces an overestimation of the relative importance of Brazil, Mexico, and Argentina in the sample.

Table 3. Asia: Sectoral GDP

(In percent of total GDP)

	1970			1994			Mean		
Country	Ag	In	Se	Ag	In	Se	Ag	In	Se
Indonesia	37	28	35	17	42	41	27	35	38
Japan	05	43	52	02	41	57	03	42	55
Korea	30	19	51	06	45	49	16	33	51
Malaysia	27	30	42	13	42	45	20	34	45
Singapore	02	38	60	01	39	61	01	39	60
Thailand	25	24	51	11	41	48	18	32	50
Taiwan Province of China	16	35	50	03	39	58	07	42	50

Note: Ag: Agriculture; In: Industry; and Se: Services

Table 4. Asia: Distribution of Regional GDP

(In percent)

Country	1970	1994	Mean
Indonesia	02	03	02
Japan	91	80	87
Korea	02	06	04
Malaysia	01	02	01
Singapore	01	01	01
Thailand	01	03	02
Taiwan Province of China	02	05	03

Tables 3 and 4 contain analogous information for the East Asian economies in our sample. As in the Latin American case, Table 3 indicates that in 1970 there were important differences in the GDP structure across countries. Whereas Japan and Singapore had agricultural sectors contributing less than 5 percent of total output, Indonesia, Korea, Malaysia, and Thailand present agricultural shares of more than 25 percent. Taiwan Province of China was an intermediate case with an agricultural share of 16 percent. In 1994, the quantitative results are different but the grouping of countries remains the same, with Indonesia, Malaysia, and Thailand displaying agricultural shares larger than 10 percent. The contribution of the agricultural sector to Korean output in 1994 is only 6 percent, significantly smaller than in 1970 but still higher than that in Taiwan Province of China (3 percent), Japan (2 percent), and Singapore (1 percent). Considering the period 1970–94, Indonesia, Korea, Malaysia, Thailand, and Taiwan Province of China experienced a remarkable structural transformation by which their agricultural share declined sharply, freeing resources to increase industry's participation in the economy.

With respect to the weights of the respective GDPs in the region (Table 4), Japan is clearly the largest country with 91 percent of the GDP in 1970, although over time the weight has declined to 80 percent in 1994. In particular, Korea and Taiwan Province of China have increased their weights (from 2 percent in 1970 to approximately 5 percent in 1994). If we drop Japan from this sample, the proportions change dramatically, although the evolution over time across countries is qualitatively similar. Korea's share increases from 27 percent of regional GDP (excluding Japan) in 1970 to 32 percent in 1994, while Indonesia's share fell from 22 percent in 1970 to 17 percent in 1994. The changes in the other countries are small with Taiwan Province of China moving from 22 percent in 1970 to 25 percent in 1994, Malaysia from 9 percent to 7 percent, Thailand from 15 percent to 13 percent, and Singapore staying at about 5 percent.

III. The Statistical Decomposition

The model described in Section I is estimated using a dummy variable regression method for the panels of data described in Section II. We first estimate regional models for Europe, East Asia, and Latin America. Table 5 reports the analysis of long-run and short-run variations in sectoral growth rates. To simplify the interpretation, we normalize both the long-run and short-run variations to add to 100 percent. The first thing to notice is that the model explains more than 60 percent of the variance of sectoral output growth rates. In particular, the model explains 60 percent in the case of Europe, 74 percent in the case of East Asia, and 65 percent in the case of Latin America.

As it can be seen from Table 5, in the European model about 80 percent of the total variations in long-run trends are explained by sector-specific effects that are country independent. In the East Asian model, although the proportion of variance explained by sector-specific effects (about 70 percent) is lower than in the European case, the results also indicate that country-specific factors would play a relatively minor role. The Latin American model displays very different results, with sector-specific effects explaining only 15 percent of the total variations of

Table 5. Analysis of Variations

(In percent)

	1970–1994		
	Europe	Asia	LAC
Long run	100	100	100
$h(i)$	79	68	15
$m(i, j)$	21	32	85
Short run	100	100	100
$b(t)$	33	27	23
$f(i, t)$	35	24	11
$g(j, t)$	32	49	66
R^2	60	74	65
	1986–1994		
	Europe	Asia	LAC
Long run	100	100	100
$h(i)$	72	63	12
$m(i, j)$	28	37	88
Short run	100	100	100
$b(t)$	29	13	8
$f(i, t)$	30	27	7
$g(j, t)$	40	59	84
R^2	58	84	63

long-run trends and country-specific effects explaining about 85 percent. Hence, it seems that country-specific factors (such as macroeconomic management and structural policies) have played a major role in determining the economic evolution of Latin American countries, while being of relatively minor importance in both East Asian and European countries.

We next turn to analyze the importance of short-run country, sectoral, and international components. Table 5 indicates that for the European countries in the sample, country-specific effects $g(j, t)$ explain less than one third of the short-run variance of output. Hence, the result found for the long run is validated in the short run. Regarding the East Asian model, the common short-run effect accounts for 27 percent of the short-term variability, whereas common sectoral factors account for 23 percent. In other words, approximately half of the short-run fluctuations in our East Asian sample have a country-specific origin. Turning to Latin America, we find that the common short-run effect accounts for less than 25 percent of explained variance, the sector-specific effect accounts for about 11 percent, and the country-specific effect represents about 66 percent of the explained short-term fluctuations. Bayoumi and Prasad (1997) report comparable results for U.S. regions, using 1-digit classification

of output, and find that the common short-run effect accounts for about 39 percent, the common sectoral factor accounts for about 34 percent, and the region-specific factor accounts for about 26 percent of the explained variance, figures comparable to the ones we obtained for Europe.[3]

In summary, we find a high degree of comovements in Europe and in East Asia, significantly larger than in Latin America. Although the statistical analysis performed in this paper does not allow us to predict the effects of a shock exogenous to a particular region, it is reasonable to expect that the reaction of countries within a weakly integrated region will be less symmetric than the reaction of highly integrated countries. This is a crucial aspect to be taken into account when analyzing the optimum currency area properties of a group of countries. We will turn to this issue later in the paper.

One limitation of the previous analysis is that the definition of each group of countries under study is given by all sample countries. Hence, it may be possible that within a region that shows little commonality there are sub-regions that are more integrated. For example, although for the Latin American countries taken together there is a low degree of integration, it could be that the level of integration is high among Mercosur or Pacto Andino countries. The low degree of integration for the whole of Latin America would be due to weak links between those two (and other) subregions. In order to further analyze this issue, in the following sections we study Latin America, East Asia, and Europe in more detail.

IV. Latin America

Table 6 reports the growth decomposition for each sector and country in the sample. Regarding long-run sectoral trends $h(i)$, the service sector has experienced the largest growth rate (4.04 percent) followed by industry (3.52 percent) and agriculture (2.63 percent). Table 6 also reports each country's performance of the three sectors relative to the sample mean. Note that the deviations from the sectoral trends in Latin American countries are larger than in the Europe and East Asia samples, reaching in some cases negative values of almost 3 percent and positive values of more than 3.5, suggesting diverging economic policies that may have been the cause of the lack of comovement in the region. The best performers are Brazil, Colombia, Costa Rica, Ecuador, and Paraguay, which display positive entries in all three sectors, whereas Argentina, El Salvador, Uruguay, and Venezuela score negative entries in the three sectors. In these countries, it is the industrial sector that is the one with poorest performance relative to the sample mean. Note that given that our sample period goes back to 1960, the relatively recent star performers (Argentina and Chile for instance) do not appear as such.

Figures 1 and 2 report the time-varying components. First, note that the time-varying common component $b(t)$ captures the debt crisis of the early 1980s. In the years from 1981 to 1986, average regional growth was 2.3 percentage points below

[3]Considering the goodness of fit in each of the three samples, if we had included the error term $u(i, j, t)$ as part of the idiosyncratic component, the levels of short-run comovement in Asia and Europe would appear closer together, while that of Latin America would still lag behind the others.

Table 6. LAC: Components

(In percentage)

	Ag	In	Se
h(*i*)	2.63	3.52	4.04
m(*i*, *Argentina*)	–0.81	–2.17	–1.46
m(*i*, *Brazil*)	0.91	0.57	0.81
m(*i*, *Chile*)	1.24	–0.51	0.36
m(*i*, *Costa Rica*)	0.37	1.26	0.20
m(*i*, *Dominican Republic*)	–0.58	0.96	1.38
m(*i*, *Ecuador*)	0.82	3.55	0.79
m(*i*, *El Salvador*)	–2.13	–2.92	–1.38
m(*i*, *Honduras*)	0.18	0.96	–0.16
m(*i*, *Mexico*)	–0.58	0.60	–0.16
m(*i*, *Uruguay*)	–1.50	–2.38	–1.33
m(*i*, *Venezuela*)	–0.18	–2.31	–1.38
m(*i*, *Colombia*)	0.67	0.84	0.68
m(*i*, *Paraguay*)	1.59	1.56	1.65

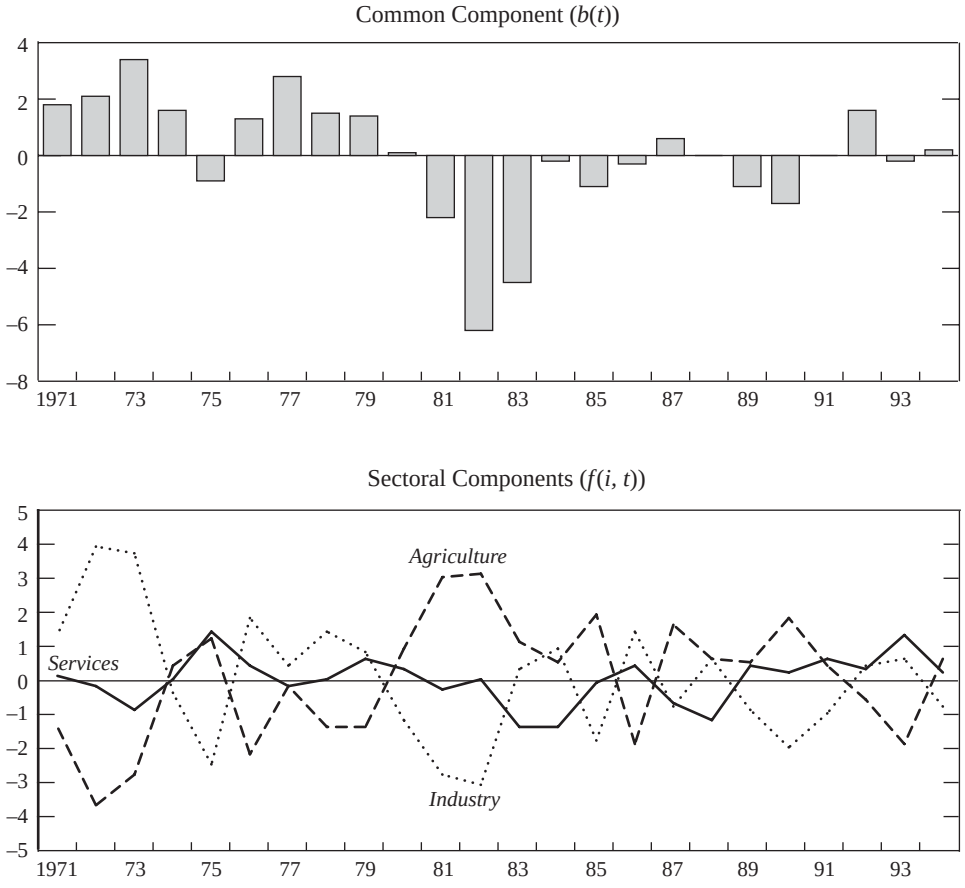
Note: Ag: Agriculture; In: Industry; Se: Services.

the 1970–94 mean, with the industrial and service sectors being the most affected ones. Another period of below average performance was 1989–90, which corresponds to the inflation (and pre-reform) crisis in several Latin American countries.

As noted in the previous section, the most remarkable result regarding the sample of Latin American countries is the large importance of country-specific components in explaining growth fluctuations. This is the case in both the long and short runs. As Table 5 indicates, in Latin America, the sector-specific component $h(i)$ explains only 15 percent of growth fluctuations in the long run, whereas in Europe and East Asia, it explains, respectively, 79 percent and 68 percent of trend fluctuations. Similarly, in the short run, the country-specific component $g(j, t)$ in Latin America (66 percent) is twice as important as in Europe (32 percent) and almost a third more important than in East Asia (49 percent).

There are several possible explanations for the lack of a major degree of comovement in the Latin America sample with respect to that found in Europe and East Asia. The first one is that the Latin America sample is larger and more heterogeneous (including countries as different as Brazil and Honduras, for instance) than those in Europe or East Asia; this would suggest that comovement should be studied between countries in smaller groups, for instance, country groups in trade-agreement areas. The second explanation is that comovement may not occur within all countries in Latin America but between specific countries and not only the rest of the region but also other regions, such as Europe, East Asia, and the United States. The third explanation is that the lack of comovement is due to the fact that until the mid-1980s most countries in Latin America were, to a large extent, closed economies; then, the pattern of comovement in the latter period

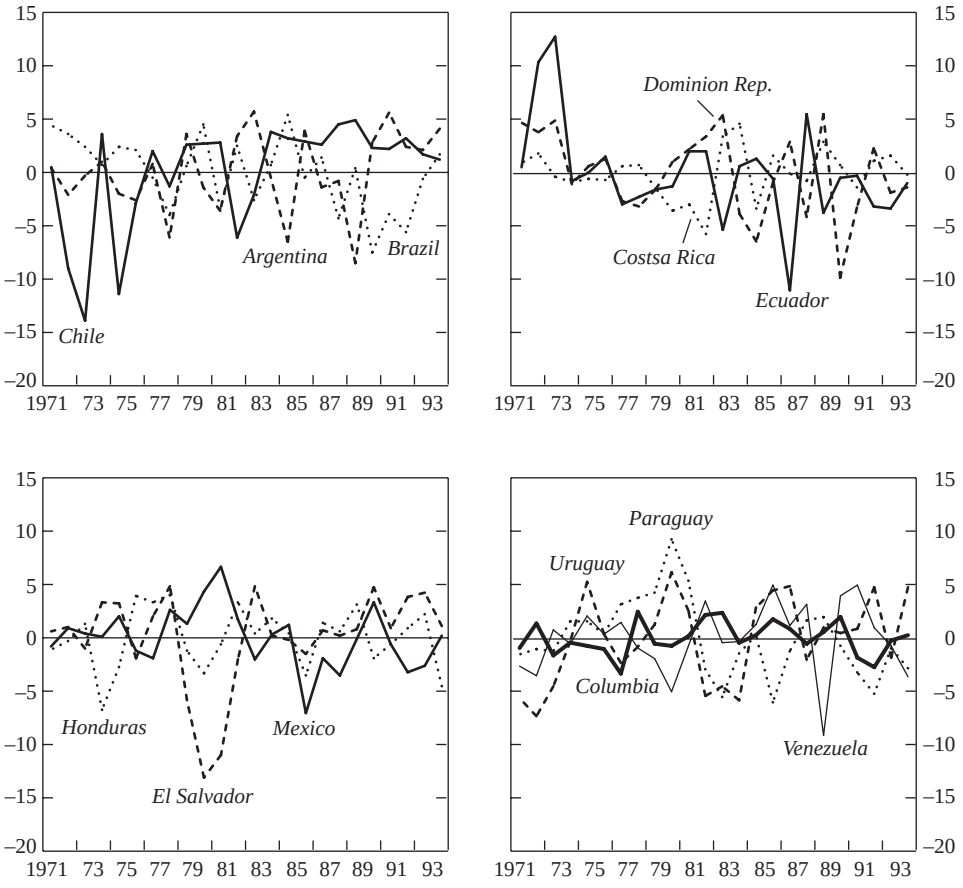
Figure 1. LAC: Common and Sectoral Components
(In percent)



(say, 1986–94) should be compared to that of the whole period. We study each of these explanations in turn.

We now address the first explanation for the lack of noticeable comovement in Latin America, namely the heterogeneity of the sample. In Table 7, we present the growth decomposition for selected groups of countries: The large-country group (Argentina, Brazil, and Mexico), the Mercosur-plus group (Chile in addition to regular members Argentina, Brazil, Uruguay, and Paraguay), the Andean Pact group (Colombia, Ecuador, and Venezuela), and the Mexico and Central America group (Costa Rica, Dominican Republic, Honduras, and Mexico). In the first three groups, the result regarding the minor importance of the sector-specific component $h(i)$ in the long run is maintained; however, in the Central America group, a large portion (80 percent) of growth trend changes are due to the sector-specific component. Therefore, for the group of large countries, for Mercosur, and for the Andean Pact, there is little evidence of long-run comovement, whereas for Central America, the degree of trend comovement is important. Regarding the decomposition of short-run fluctuations, similarly to the result for the whole Latin

Figure 2. LAC: Country Specific Component ($g(j,t)$)
(In percent)



America sample, the most important component remains the country-specific one $g(j, t)$. This is the case for all country groups except the Andean Pact group, where the other components (time- and industry-specific) are equally as important as the country-specific component.

An interesting hypothesis, generally maintained in both the press and policy circles, is that there is a significant comovement between the largest countries in Latin America, namely, Brazil and Mexico, and the rest. To examine this hypothesis, we first pair Brazil with each of the remaining 12 countries in the Latin America sample, and then we repeat the procedure substituting Mexico for Brazil. The results are reported in Table 8. There are several countries that seem to have a large degree of long-run comovement with Brazil (Table 9).[4] In fact, when Chile, Costa Rica, the Dominican Republic, Honduras, Mexico, Colombia, and Paraguay

[4]Another way of assessing the importance of large countries is to pair each country in Latin America with the (GDP-weighted) average for the rest of the region (Table 9). Because of the size of Brazil (40 percent of regional GDP), the results are essentially similar to those corresponding to this country.

Table 7. LAC: Analysis of Variations

(In percent)

	Argentina+ Brazil+Mexico	Mercosur-Plus	Andean Pact	Central American Countries+Mexico
Long run	100	100	100	100
$h(i)$	22	14	11	80
$m(i, j)$	78	86	89	20
Short run	100	100	100	100
$b(t)$	32	30	33	40
$f(i, t)$	21	19	35	17
$g(j, t)$	48	51	32	43
R^2	73	72	67	76
		1986–94		
Long run	100	100	100	100
$h(i)$	11	17	5	18
$m(i, j)$	89	83	95	72
Short run	100	100	100	100
$b(t)$	23	16	30	31
$f,(i, t)$	16	16	21	17
$g(j, t)$	60	67	49	52
R^2	71	73	66	73

are individually joined with Brazil, the proportion of growth trend movements explained by the sector-specific component is larger than 60 percent.

On the other hand, El Salvador, Venezuela and, surprisingly, Argentina and Uruguay show little comovement with Brazil in the long run. Regarding short-run fluctuations, comovement with Brazil is also important for Costa Rica, the Dominican Republic, Ecuador, Honduras, Mexico, Uruguay, Colombia, and Paraguay; in fact, in these cases, country-specific factors account for less than 25 percent of short-run fluctuations. Note that both Argentina and Uruguay have an important degree of comovement with Brazil (67 percent and 76 percent, respectively) in so far as short-term fluctuations are concerned, whereas they are mostly independent from Brazil in terms of long-run trends.

When countries are paired with Mexico, we find long-run comovement larger than 75 percent in the cases of Colombia and the Central American countries of Costa Rica, the Dominican Republic, and Honduras. The Central American countries (with the exception of El Salvador) are more linked to Mexico than to Brazil in long-run trends. Surprisingly, however, in the short run they have more commonality with Brazil. Countries that share short-term fluctuations with Mexico are Ecuador, Uruguay, Colombia, and Paraguay (for all of them, country-specific factors explain less than 30 percent of short-run fluctuations). Finally, it

Table 8. LAC: Analysis of Variations

(In percent)

	Brazil											
	Argentina	China	Costa Rica	Dominican Republic	Ecuador	El Salvador	Honduras	Mexico	Uruguay	Venezuela	Colombia	Paraguay
Long run	100	100	100	100	100	100	100	100	100	100	100	100
$h(i)$	15	64	77	80	50	21	68	64	20	15	97	64
$m(i, j)$	85	35	22	20	50	79	32	36	80	85	3	36
Short run	100	100	100	100	100	100	100	100	100	100	100	100
$b(t)$	36	35	44	54	39	39	42	47	39	35	42	50
$f(i, t)$	29	27	32	30	46	26	34	32	37	31	36	32
$g(j, t)$	33	37	24	16	15	34	23	22	24	35	22	18
R^2	77	79	85	83	79	86	80	84	87	79	81	85

	Mexico										
	Argentina	China	Costa Rica	Dominican Republic	Ecuador	El Salvador	Honduras	Uruguay	Venezuela	Colombia	Paraguay
Long run	100	100	100	100	100	100	100	100	100	100	100
$h(i)$	26	36	85	86	58	33	92	35	17	75	43
$m(i, j)$	74	64	15	14	42	67	8	65	83	25	53
Short run	100	100	100	100	100	100	100	100	100	100	100
$b(t)$	34	39	47	45	40	38	46	44	35	52	65
$f(i, t)$	23	24	19	22	42	16	25	30	29	23	25
$g(j, t)$	43	37	34	33	18	45	29	26	37	26	10
R^2	78	83	86	85	75	85	80	85	85	83	88

Table 9. LAC: Analysis of Variations, Rest of LAC
(In percent)

	Argentina	Brazil	China	Costa Rica	Dominican Republic	Ecuador	El Salvador
Long run	100	100	100	100	100	100	100
$h(i)$	22	35	63	55	68	32	32
$m(i, j)$	78	65	37	45	32	68	68
Short run	100	100	100	100	100	100	100
$b(t)$	38	42	39	53	50	37	44
$f(i, t)$	28	32	26	27	26	46	21
$g(j, t)$	33	26	34	20	23	17	33
R^2	78	80	87	89	86	74	88

	Honduras	Mexico	Uruguay	Venezuela	Colombia	Paraguay
Long run	100	100	100	100	100	100
$h(i)$	63	65	33	25	56	27
$m(i, j)$	37	35	67	75	44	73
Short run	100	100	100	100	100	100
$b(t)$	45	49	43	41	48	53
$f(i, t)$	32	25	34	29	36	28
$g(j, t)$	23	26	23	29	16	18
R^2	84	86	86	79	86	88

is noteworthy that Venezuela is the country with the smallest long-run comovement with either Brazil or Mexico.

In order to address the second explanation for the lack of comovement in Latin America (namely, that comovement may occur between specific Latin American countries and countries outside the region) we undertake the growth decomposition considering groups of "rest of the world" regions, which include the average for East Asia, the average for Europe, the United States, each Latin American country in turn, and the average for the rest of the region.[5] The results are presented in Table 10.

The finding regarding the importance of the country-specific component in explaining both long- and short-run growth changes still holds true but less strongly in the new samples; that is, there is somewhat larger comovement between any Latin American country and the rest of the world than comovement only within the region. Except for the Dominican Republic, in all cases the country-specific component accounts for at least 60 percent of growth trend fluctuations. Regarding short-run fluctuations, the country-specific effect remains the most important component, accounting for more than 45 percent of short-run growth movements in 9 of the 13 countries in Latin America (and more than

[5]For example, for the case of Argentina the group includes the average for East Asia, the average for Europe, the United States, and the average for Latin America *without* Argentina, and Argentina.

Table 10. LAC: Analysis of Variations, Rest of the World

(In percent)

	Argentina	Brazil	China	Costa Rica	Dominican Republic	Ecuador	El Salvador
Long run	100	100	100	100	100	100	100
$h(i)$	26	31	27	35	41	22	29
$m(i, j)$	73	69	72	65	59	78	71
Short run	100	100	100	100	100	100	100
$b(t)$	22	26	23	30	27	27	23
$f(i, t)$	24	27	24	25	23	34	22
$g(j, t)$	54	46	54	44	49	38	54
R^2	65	66	69	69	69	64	73

	Honduras	Mexico	Uruguay	Venezuela	Colombia	Paraguay
Long run	100	100	100	100	100	100
$h(i)$	33	39	31	25	32	23
$m(i, j)$	66	61	69	75	68	77
Short run	100	100	100	100	100	100
$b(t)$	29	30	24	24	29	28
$f(i, t)$	29	24	25	28	29	24
$g(j, t)$	42	45	52	47	41	48
R^2	67	68	67	68	66	70

38 percent in all 13 countries). The time-specific component is as important as the industry-specific component in explaining short-run fluctuations.

Of independent importance is the relationship between each Latin American country and the United States. The results are reported in Table 11. The countries that appear to have some degree of comovement with the United States (more than 40 percent) in both the long and short run are Argentina, Chile, Uruguay, and Venezuela. Other countries, such as Brazil, Ecuador, Colombia, and Mexico, do not share long-run trends with the United States but appear to have a common cycle with this country; in fact when these four countries are paired with the United States, the country-specific component explains less than 25 percent of the short-run fluctuations.

The third proposed explanation for the lack of comovement in the Latin America sample is the fact that most economies remained relatively closed to international trade until the late 1980s. To consider this explanation, we replicate some of the previous decompositions, considering information for only the period 1986–94 (see second panel of Tables 5 and 7). A pattern of comovement in the latter period stronger than that in the whole period (1970–94) would point to the effect of closer trade integration. Contrary to our expectations, when we use data for the period 1986–94, we find weaker comovement within the whole Latin America sample, within subgroups of countries, and between each country and the rest of the world. This result applies to both the long and short runs.

Table 11. LAC: Analysis of Variations, USA

(In percent)

	Argentina	Brazil	China	Costa Rica	Dominican Republic	Ecuador	El Salvador
Long run	100	100	100	100	100	100	100
$h(i)$	58	17	44	10	33	12	39
$m(i, j)$	42	82	56	90	67	88	61
Short run	100	100	100	100	100	100	100
$b(t)$	26	32	41	39	30	28	33
$f(i, t)$	40	46	36	39	37	54	34
$g(j, t)$	33	22	23	21	32	18	32
R^2	74	83	79	79	80	83	84

	Honduras	Mexico	Uruguay	Venezuela	Colombia	Paraguay
Long run	100	100	100	100	100	100
$h(i)$	10	25	45	78	14	08
$m(i, j)$	90	75	54	22	86	92
Short run	100	100	100	100	100	100
$b(t)$	33	43	356	30	29	36
$f(i, t)$	48	36	39	43	48	35
$g(j, t)$	18	22	26	27	22	28
R^2	82	73	75	76	72	78

We explain the finding with the following arguments. First, the comovement evidenced in the Latin American sample for the period 1970–94, though small, may be mostly due to the common experience with the debt crisis in the early 1980s, possibly the oil shocks in the mid-1970s, and the macroeconomic adjustment of the late 1980s and early 1990s; in the period 1986–94, only the latter common event took place, thus reducing the causes for comovement. From this reasoning, we can draw the implication that it is basically major events that have driven the (small) comovement across countries in Latin America. Second, the process of trade integration takes time, and the related interdependence among countries in the region will be perceived only in the most recent and future years. And third, the growth experience in Latin American countries in the 1990s has been driven by their idiosyncratic reform processes and their recovery from major macroeconomic crises; as economies stabilize on a sustained growth pattern, and as trade integration sets in, we expect to see a higher degree of long- and short-run comovement in Latin America.

In general, we can conclude that the lack of comovement among Latin American countries is robust to different time periods, different sample sizes, and different groupings of countries. The only nuance to this conclusion is that there appears to be some comovement between a given large country (Brazil or Mexico) and some other countries in the region.

Table 12. Asia: Components
(In percent)

	Ag	In	Se
h(*i*)	1.83	8.33	7.23
m(*i, Indonesia*)	1.86	0.16	0.32
m(*i, Japan*)	–1.64	–4.85	–3.19
m(*i, Korea*)	0.09	3.73	1.04
m(*i, Malaysia*)	1.97	–0.04	–0.05
m(*i, Singapore*)	–3.78	–0.45	0.59
m(*i, Thailand*)	1.92	1.16	–0.25
m(*i, Taiwan Province of China*)	–0.43	0.30	1.55

Note: Ag: Agriculture; In: Industry; Se: Services.

V. East Asia

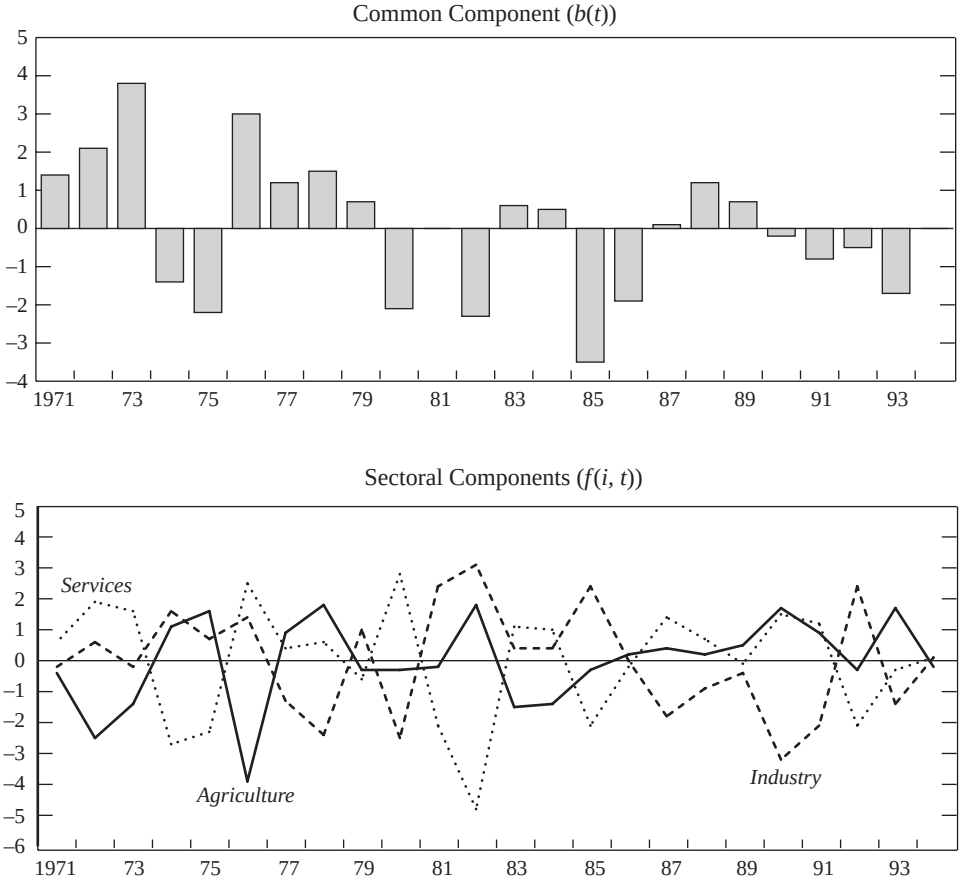
The East Asian region has enjoyed a long period of macroeconomic stability, with inflation under control and manageable levels of debt, and high growth, with rapid export growth as a common important element of this expansion (see World Bank, 1993). In fact, the East Asian model is the one with the best goodness of fit, explaining 75 percent of the variance of sectoral output growth rates (see Table 5). The results are fairly similar to the European case, 68 percent of the variance of long-run growth and 51 percent of the short run are explained by non-idiosyncratic factors, and the common short-run fluctuations are evenly explained by the national and the sectoral component (27 percent and 24 percent, respectively). These results are consistent with the high degree of regionalization of the area. In fact, intra-regional trade has grown strongly in East Asia, where it accounts for 40 percent of total exports, compared to 20 percent in Latin America.

Turning to the decomposition of actual growth rate fluctuations, Table 12 shows the dominance of industry and services over agriculture in explaining the pattern of East Asian long-term growth, reflecting the export-push polices developed in all the region. The industrial sector grew at an impressive average of 8.3 percent a year over 1970–94, and the service sector at an average of 7.3 over the same period. The agricultural sector grew at an average rate of 1.8 per year, lower than the other sectors but still higher than the average growth rate of European agriculture.[6]

The analysis of the idiosyncratic long-term components, *m*(*i, n*), shows several interesting results. First, Japan has fared below average in all sectors, specially in industry, a fact that may be explained by the lower initial condition, and subsequent convergence, of the rest of the countries of the sample (see Table

[6]Notice, however, that this comparison may be misleading owing to the fact that some of the European countries with larger agricultural sectors, such as Portugal and Greece, are missing from the

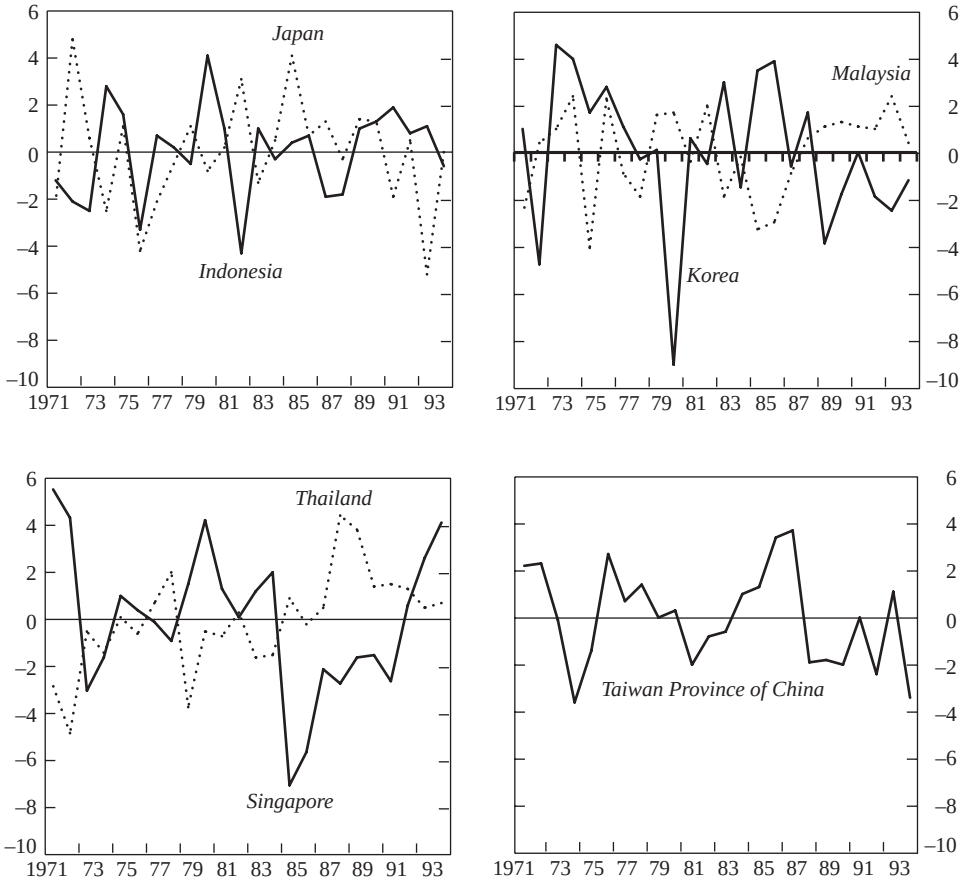
Figure 3. Asia: Common and Sectoral Components
(In percent)



3). In fact, Table 3 shows the different stage of development of Japan and the rest of countries in the sample in 1970. By the same token, Indonesia and Korea have been the best performers of the sample. In particular, the development of Korean industry has been impressive, growing an average 3.7 percent over the already high regional average of 8.3 percent. This means that Korean industry has grown at an annual rate of 12 percent over 24 years! Taiwan Province of China, Singapore, and Korea have been the best performers in services, and Indonesia, Malaysia, and Thailand in agriculture. This pattern of growth explains the changes in sectoral GDP observed over the period (see Table 3).

The pattern of short-term fluctuations is depicted in Figures 3 and 4. The short-term common component, $b(t)$, captures an important dive in 1985–86 resulting from the decline in oil prices that affected the oil exporting countries of the group and the recession of the early 1990s. The standard deviation of the East Asian business cycle is 1.8, similar to the European one. The sectoral components $f(i, t)$ show how the oil crisis hit mainly the industry sector. In 1973–74, the

Figure 4. Asia: Country Specific Component ($g(j,t)$)
(In percent)



industry sector took a hit of –5.0, compared to –2.5 in Europe; in 1981–82, the comparison is –6.9 in East Asia and –5.2 in Europe. The numbers for the recession of the 1990s suggest that it was the agriculture sector which suffered the most. If we add the components for each of the sectors for the period 1990–94, the results are –4.3 for agriculture, 0.4 for industry and 3.8 for services. Hence, it seems that during the last recession there was an important migration of activity from agriculture to services.

Next we move to the analysis of subgroups of countries. The first exercise we perform is to remove Japan from the sample, given its extraordinary weight. As expected, the common long-term component increases (to 81 percent, compared to 68 percent for the whole sample) and is higher than for Europe and Latin America. However, the short-run component decreases somewhat. This decline would be explained by both the importance of Japanese direct investment into these countries (see Frankel and Wei, 1996) and the importance of regional trade with Japan. In order to further investigate this issue, we perform an exercise for pairs of countries including Japan and each of the others in turn. The results show

that Japan has close links with all the countries: the common short-term component is never lower than 75 percent. The closest links are with Korea (sectoral) and Taiwan Province of China (national).

The 1980s and 1990s have been the years of general opening of the world economies, although, as suggested by some authors, in East Asia this process has been focused within the region. We check this issue by removing Japan from the sample and introducing the United States. The results show a somewhat lower common long-run component, 50 percent, but a similar short-term common component, 25 percent national and 23 percent sectoral. This cast doubt on the suggestion that East Asian economies have gone through a process of opening that is restricted to the region.

The next exercise is related to the recent East Asian crisis. The crisis was triggered by the problems that the Thai bhat experienced in 1997. After that, Korea and Indonesia faced serious crises, whereas the rest of the countries did not. Can this be explained by our decomposition? In fact, in the light of the above exercise, one could expect that, given the high degree of commonality in the region, a crisis in a country would rapidly spill over to the rest of the region. Table 13 shows the result of computing our coefficients for pairs of countries including Thailand and one of the others in turn. Perhaps not surprisingly, the countries with the closest links to Thailand are Indonesia, Malaysia, and Korea, with a common short-term component of 84 percent, 83 percent, and 81 percent, respectively. Hence, it is not surprising from a "fundamental" point of view that a crisis in Thailand affected these other countries. The reason why the crisis affected Indonesia and Korea in a much stronger way than Malaysia could be the very high common sectoral component, much lower in Malaysia. Hence, it is likely that the same types of industries were affected in all three countries and this, compounded by the fragile state of the banking sector in these countries and the maturity and currency composition of debt, created a cocktail that proved much more difficult to digest for Indonesia and Korea than for Malaysia.

Thus, it seems that this group of countries has achieved an important degree of economic integration. Trade and investment intra-region has reached very high levels, and the similar pattern of economic development has created countries with very similar economic structures. This high degree of integration and symmetry would indicate an ideal environment for the implementation of a currency area. Bayoumi and Eichengreen (1996) analyze this issue in detail and conclude that, political issues aside, this group of East Asian countries would qualify as much as Europe to form a currency area. They study the degree of symmetry and correlation of supply and demand shocks by means of structural VARs, and indicate that Indonesia, Malaysia, Singapore, and Thailand have highly correlated demand shocks. As regards to supply shocks, they find two groups of countries, namely Japan, Korea, and Taiwan Province of China, and Indonesia, Malaysia, and Singapore.

Our model allows us to perform a similar study with a completely different methodology of identification. We identify two types of common components, $b(t)$ and $f(i, t)$. The first one, $b(t)$, includes disturbances that are common across countries that affect evenly all the sectors. This could be identified as a common aggre-

Table 13. Asia: Analysis of Variations

(In percent)

	Thailand-Indonesia	Thailand-Japan	Thailand-Korea	Thailand-Malaysia	Thailand-Singapore	Thailand-Taiwan Province of China
Long run	100	100	100	100	100	100
$h(i)$	98	44	92	97	79	91
$m(i, j)$	2	56	8	3	21	9
Short run	100	100	100	100	100	100
$b(t)$	28	38	36	46	33	43
$f(i, t)$	56	37	46	37	37	30
$g(j, t)$	16	25	19	17	30	27
R^2	86	93	83	92	99	91

	Japan-Indonesia	Japan-Korea	Japan-Malaysia	Japan-Singapore	Japan-Taiwan Province of China
Long run	100	100	100	100	100
$h(i)$	46	51	45	76	61
$m(i, j)$	54	49	55	24	39
Short run	100	100	100	100	100
$b(t)$	22	30	40	38	48
$f(i, t)$	53	50	35	34	30
$g(j, t)$	25	20	25	27	22
R^2	86	90	92	95	92

	Indonesia-Singapore-Japan	Taiwan Province of China-Singapore	Taiwan Province of China-Singapore-Korea
Long run	100	100	100
$h(i)$	81	97	85
$m(i, j)$	19	7	15
Short run	100	100	100
$b(t)$	28	49	48
$f(i, t)$	25	29	23
$g(j, t)$	46	22	29
R^2	73	95	87

gate demand shock. Likewise, $f(i, t)$ is a shock that affects the same sector in all the countries, a clear example of a common supply shock. Hence, we can compute our decomposition for all possible pairs of countries and identify the ones that are linked more closely together.

Table 14. Europe: Components

(In percent)

	Ag	In	Se
$h(i)$	1.35	2.21	2.94
$m(i, Germany)$	0.31	–0.48	0.17
$m(i, France)$	0.02	–0.43	0.24
$m(i, Italy)$	–0.42	–0.10	–0.29
$m(i, Spain)$	–0.14	0.64	0.36
$m(i, Belgium)$	0.50	0.05	–0.42
$m(i, Austria)$	–0.27	0.32	–0.05

Note: Ag: Agriculture; In: Industry; Se: Services.

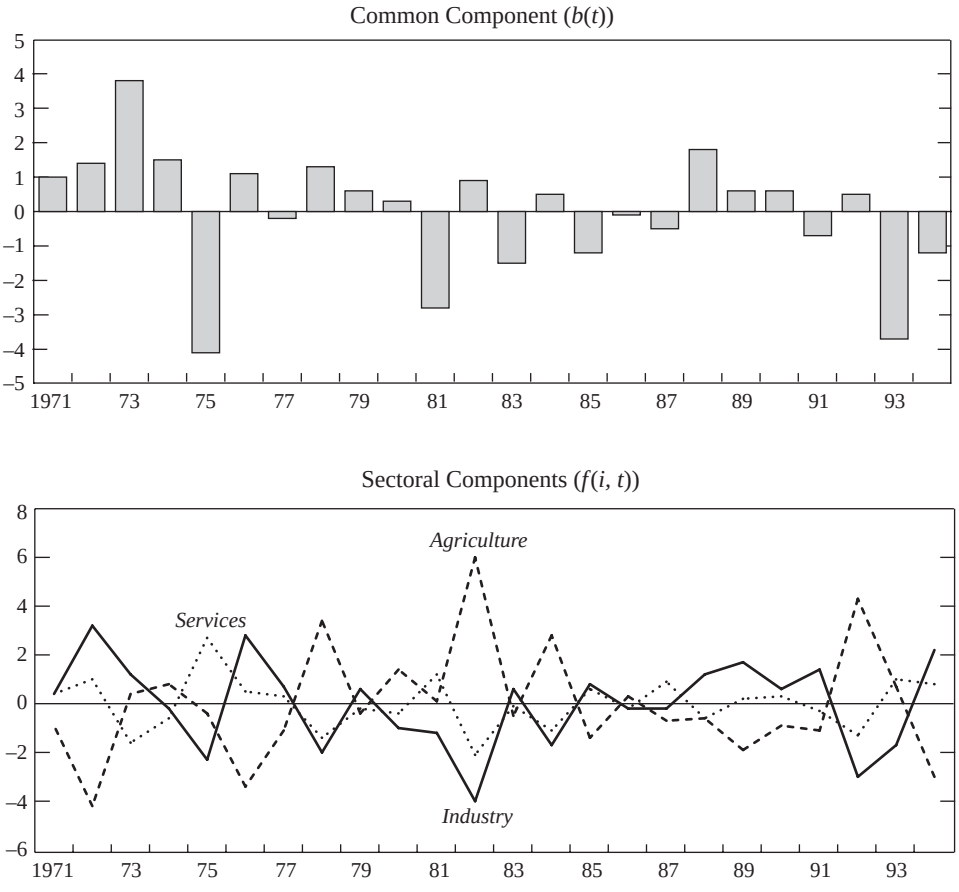
We have grouped the countries with the highest short-term commonality ($b(t) + f(t)$), and we obtain two groups: Japan, Korea, Singapore, and Taiwan Province of China, in one group and Indonesia, Malaysia, and Thailand in another group. In each of these groups, about 75 percent of short-term fluctuations are common, values very similar to the ones obtained for the core European countries (see next section). Hence, within this already highly integrated area, these two sub-regions could be as good as the core European countries as candidates for a common currency area.

VI. Europe

Our first step is to analyze the sectoral decomposition of output growth fluctuations, reported in Table 14. Consider first the sectoral trends $h(i)$. The point estimates indicate that services output has grown at a rate of about 3 percent per year, whereas industrial output has grown at a rate of about 2.2 percent. Agricultural output has lagged behind with a growth rate of less than half that of the services sector.

As expected from the variance decomposition reviewed previously, the country-specific deviations from the sectoral trends are very small and are in no case larger than 1 percent in absolute value. Italy seems to have been the worst performer, with negative entries in the three sectors. No country has dominated the period, however, and no single country has positive entries in all three sectors. Spain is the best performer in industry and services, and Belgium in agriculture. Figures 5 and 6 report the evolution of the common short-run component $b(t)$. Notice that it captures the crisis of 1975 (–4.1 percent), the recovery of 1978–80, the slump of 1981–83 that followed the second oil crisis, and the halt of the most recent recession in 1993 after the ERM crisis of 1992. The standard deviation of the common short-run factor is 1.78. Judging from point estimates, the ERM crisis had similar real effects to the first oil crisis. Apart from these crisis episodes, the common short-run effect presents very small fluctuations.

Figure 5. Europe: Common and Sectoral Components
(In percent)



Turning to the time-varying sectoral effects $f(i, t)$, notice that the fluctuations in the agricultural sector are higher than those in the industrial sector, which in turn are higher than in the service sector. Formally, the standard deviations of each of the sectoral business cycles are 2.3, 1.8, and 1, respectively. This implies that, apart from idiosyncratic effects, the higher the contribution of the agricultural sector to GDP the higher the fluctuations of the aggregate business cycle. The industrial sector shows the full impact of the two oil crises, showing in 1975 and 1982 a negative effect of –2.3 and –4 percent respectively, and similar results are obtained for the service sector, with important negative entries in 1973, 1982, and 1992.

Our final analysis relates to the optimal-currency-area properties of the European countries of our sample. Bayoumi and Eichengreen (1993) address this issue by assessing the importance of asymmetric or country-specific shocks within the European Union, and conclude that Germany and the core countries (Germany's immediate neighbors) show a higher degree of commonality in their response to shocks than the countries at the periphery.

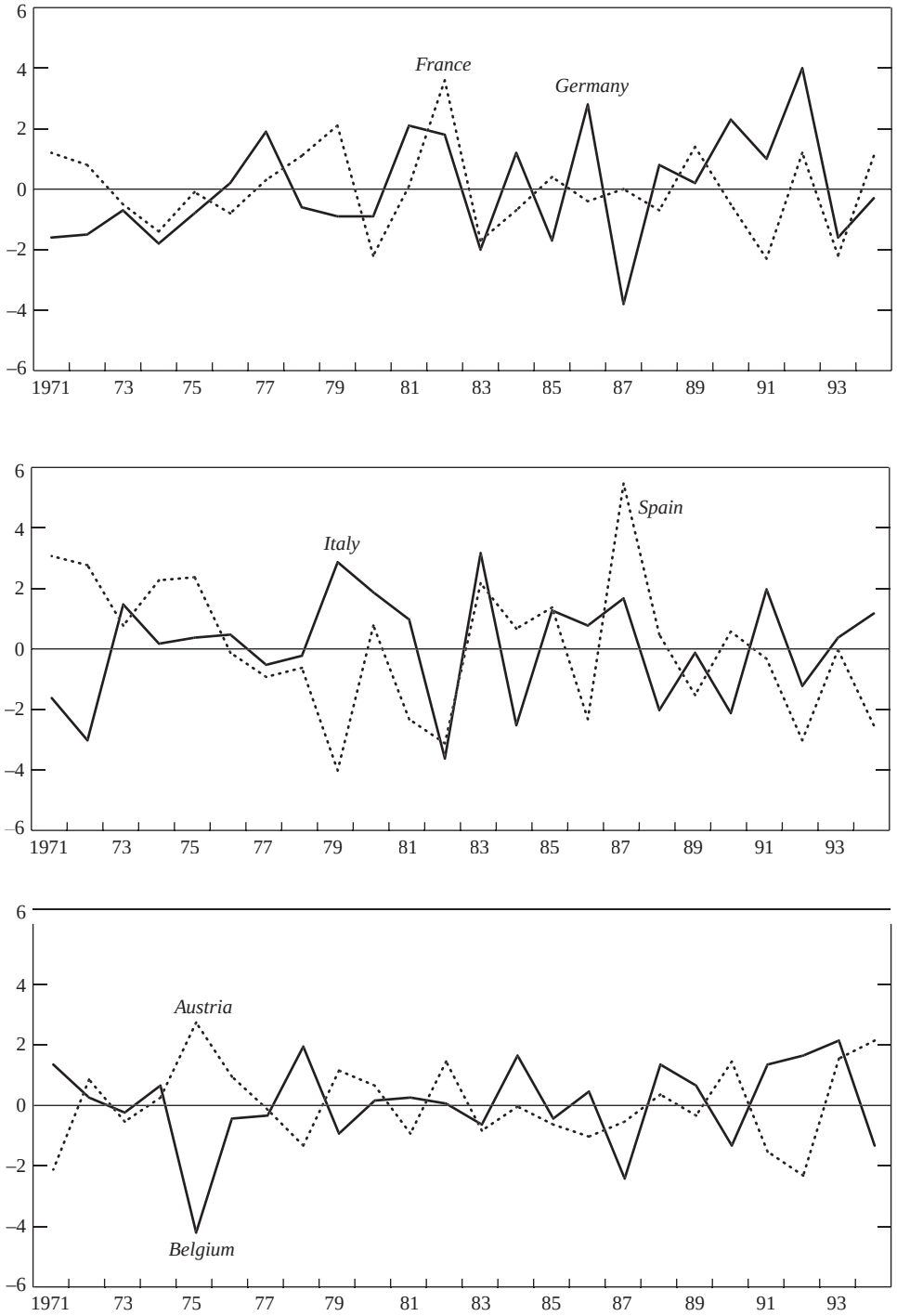
Table 15. Europe: Analysis of Variations

(In percent)

	Germany-France	Germany-Italy	Germany-Spain	Germany-Belgium	Germany-Austria
Long run	100	100	100	100	100
$h(i)$	98	85	80	79	85
$m(i, j)$	2	15	20	21	15
Short run	100	100	100	100	100
$b(t)$	35	30	30	36	27
$f(i, t)$	58	48	44	57	62
$g(j, t)$	7	20	26	7	10
R^2	86	66	65	82	82
	Germany-France-Italy	Germany-France-Spain	Germany-France-Belgium	Germany-France-Austria	
Long run	100	100	100	100	
$h(i)$	89	84	84	88	
$m(i, j)$	11	16	16	12	
Short run	100	100	100	100	
$b(t)$	33	33	37	33	
$f(i, t)$	45	41	52	54	
$g(j, t)$	21	26	10	12	
R^2	67	66	79	78	
	Spain-Italy	Spain-France	Spain-Italy-France		
Long run	100	100	100		
$h(i)$	88	86	85		
$m(i, j)$	12	14	15		
Short run	100	100	100		
$b(t)$	37	40	36		
$f(i, t)$	45	40	34		
$g(j, t)$	19	20	29		
R^2	76	75	66		

As we showed in the previous section, our model allows us to perform a similar study with a completely different methodology of identification. Hence, we can compute our decomposition for all possible pairs of countries and identify the ones that are linked more closely together. We selected Germany as the anchor, and Table 15 reports the results of the models that combine Germany and, in turn, five other European countries. We find that the non-core countries, namely, Italy and Spain, are those with the highest variance explained by country-specific factors (more than 20 percent). There is in fact evidence of more integration of

Figure 6. Europe: Country Specific Component ($g(j,t)$)
(In percent)



Germany with the core countries, namely, France, Belgium, and Austria, which confirms Bayoumi and Eichengreen's results. It is interesting to note that the lower integration with non-core countries is due to sectoral differences. Whereas the variance explained by $f(i, t)$ in the pairs with Spain and Italy is 44 percent and 48 percent, respectively, in the cases of France, Belgium, and Austria, it is 58 percent, 57 percent, and 62 percent, respectively. This indicates that similarities across sectors are larger among the core countries than among these countries and Italy and Spain. The exercise with France as anchor reports similar results to those using Germany as anchor, which is not surprising given the high degree of comovement between these two economies.

Summing up, the estimated results for the different sub-groups confirm a large degree of integration between the six European countries under analysis. We support the evidence of the existence of two groups of countries, the core and the periphery, a distinction based mainly on sectoral differences rather than on diverging economic policies.

VII. Conclusions

In this paper we have investigated the existence of common patterns in the aggregate cyclical behavior across countries and sectors. We have used an error components model that allows us to gauge the proportion of real value-added growth that can be attributed to common international effects, sector-specific effects and country-specific effects.

We find an important degree of comovement across countries, although with important differences across regions. The degree of commonalities is high in Europe and in Asia, but low in Latin America, where domestic idiosyncratic factors dominate. These results for Latin America are robust to different sub-sample periods and sub-sample groupings of countries.

These results are interesting in several dimensions. First, in terms of their optimal currency areas implications, the evidence shows that the East Asian countries are as good candidates for the establishment of a currency area as the European economies are. In fact, both groups of countries display a degree of comovement comparable to that of U.S. regions. In Latin America, however, it seems that no group of countries would have comparable properties to the European and Asian groups. Second, our estimates suggest that the Latin American countries are more sensitive to developments out of the region than to developments within the region. Hence, this casts doubt on the existence of "regional effects" of crises in Latin America, and it is more likely that the transmission of external crises will be to individual countries (as has been the case with Brazil during the Asian crisis). Finally, in terms of policy coordination, it seems that, given their higher degree of economic integration, such coordination would be desirable in both Europe and Asia. In Latin America, however, our results suggest that each country may be approached individually rather than on a regional basis, given their highly idiosyncratic characteristics.

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