

## **Chapter 2**

### **Macroeconomic dynamics after NAFTA: synchronization, volatility and macroeconomic policy coordination**

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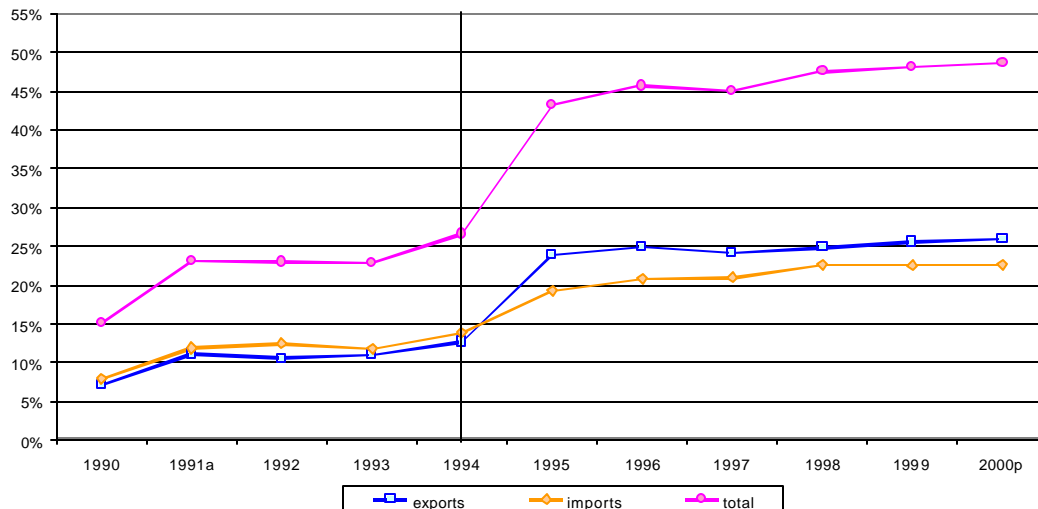
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## 2.1 Introduction

What are the consequences of NAFTA for the conduct of macroeconomic policy in Mexico? The agreement contained no explicit provisions in this regard, but its implementation may have a significant effect on Mexico's macroeconomic dynamics. This is so because Mexico's trade (as well as financial) integration with its NAFTA partners should lead to an increased similarity among their respective business cycles, and this in turn will change the desirability of alternative fiscal and monetary policies for Mexico.

Figure 1 illustrates the high degree of trade integration with NAFTA partners that Mexico has reached in recent years. By the end of the 1990s, total trade with the U.S. and Canada represented almost 50 percent Mexico's GDP, and over 80 percent of its total trade. Exports to NAFTA partners accounted for more than one-fourth of its GDP and 90 percent of total exports. One would expect that this rising degree of trade intensity should lead to Mexico's economy marching in step with those of its NAFTA partners. Yet trade is not the only factor affecting macroeconomic synchronization, and other ingredients – such as the similarity of production structure, financial integration and policy coordination – also matter. Moreover, synchronization is not an automatic byproduct of trade integration – indeed, there are theoretical arguments that trade and/or financial integration among dissimilar countries could actually result in reduced, not increased, macroeconomic synchronization, through specialization of the countries involved that would leave them more exposed to asymmetric shocks.

**Figure 1 Mexico: Trade with NAFTA countries (percent of GDP)**



Macroeconomic synchronization is important because it provides an indicator of the necessity of independent fiscal and monetary policies. If Mexico's business cycles become more similar to those of the U.S. and Canada, and its macroeconomic variability is dominated by shocks common with its FTA partners, then Mexico would benefit from the stabilization policies followed by them and, indeed, its own desired policy adjustments would be similar to those desired by the other two countries. In the limit, Mexico could benefit from a common macroeconomic policy with NAFTA members – perhaps even in terms of a currency union. Indeed, the theory of optimal currency areas (OCA for short) implies that the benefits from a currency union rise with the volume of trade among member countries, while the costs increase with the degree of asymmetry of their business cycles.<sup>1</sup>

On the contrary, if business cycles in NAFTA countries are not becoming more synchronized, and Mexico's macroeconomic variability is dictated primarily by idiosyncratic shocks, then policy synchronization and coordination would be less likely to help reduce macroeconomic volatility in Mexico, which would instead require the authorities to implement policies potentially very different from those followed by the U.S. and Canada.

The proper design of Mexico's policies to reduce its macroeconomic volatility is an important issue in the post-NAFTA context. Macroeconomic volatility is a potential obstacle for the country to reap the full benefits from trade integration. The reason is that those benefits accrue primarily through trade and investment flows, and volatility -- traditionally high in Mexico, like in the rest of Latin America -- represents a powerful deterrent to both trade and investment.

From a positive perspective, it is also useful to assess the degree to which synchronization is changing, because it can shed light on the likelihood of a further deepening of the economic integration process. If business cycles are becoming highly symmetric, FTA members will be more likely than otherwise to consider further steps to enhance economic integration, including measures such as policy coordination.

In this chapter we assess the changes in macroeconomic synchronization between Mexico and the U.S. and Canada after NAFTA, and draw their implications for macroeconomic policy.<sup>2</sup> We consider three different aspects of synchronization. The first issue is whether the economies of the NAFTA countries tend to co-move more closely together (i.e. in the same direction at the same time) than before implementation of the trade agreement. The second issue is whether the Mexican economy has become more sensitive to developments in its NAFTA partners, i.e. whether business cycle fluctuations in Canada or the U.S. generate a larger response in the Mexican economy than before. The third issue is whether shocks to growth in Canada or the U.S. have become a more important source of volatility for Mexico relative to other types of shocks, i.e. whether

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<sup>1</sup> See Mundell (1961) and McKinnon (1963). In a stylized model, Alesina and Barro (2002) show that the key issue is the variance of asymmetric shocks, both nominal and real. See also Alesina et al (2002) for a recent empirical application to a large country sample, including Mexico.

<sup>2</sup> The chapter draws from the background paper by Cuevas et al (2002).

the business cycle in these countries has become more important for the Mexican economy than other shocks such as terms of trade, financial contagion from other emerging markets or domestic aggregate demand shocks.

These three dimensions are related but distinct. A rise in the observed sensitivity of the Mexican economy to contemporaneous developments in its NAFTA partners could reflect either increased co-movement or higher volatility in Mexico without any change in the degree of co-movement. In the latter case, the contribution of idiosyncratic shocks to Mexico's overall volatility need not have declined after NAFTA. Conversely, a lower contribution of idiosyncratic factors to Mexico's macroeconomic volatility, in the absence of any increase in sensitivity to developments in the U.S. and Canada, might just reflect a more limited incidence of idiosyncratic shocks over the post-NAFTA period, which might not persist in the future. Of course, as we shall discuss later, it is also possible that NAFTA itself may have affected the frequency and magnitude of idiosyncratic shocks to the Mexican economy.

Therefore, to conclude with some confidence that greater economic integration between Mexico and its partners has contributed to greater macroeconomic synchronization in the region, we should find that, first, there has been an increase in the degree of business cycle co-movement among the NAFTA countries in recent years; second, that the sensitivity of the Mexican economy to developments in the U.S. and Canada has increased and, third, that shocks to growth in the U.S. and Canada have become a larger source of Mexico's growth volatility.

Even in that case, however, we have to keep in mind that the results from the analysis below are tentative, given the short time elapsed since the implementation of NAFTA. Most importantly, the results are conditional on the pattern of shocks actually observed in the post-NAFTA years. There is no assurance that such pattern, and specifically the relative frequency and magnitude of common vs. idiosyncratic shocks observed in those years, will persist in the future. For these reasons, the findings of this chapter have to be taken with caution.

## **2.2 Trade integration and macroeconomic synchronization**

### *2.2.1 Theory*

Trade integration is an important determinant of macroeconomic co-movement. In theory, however, the impact of the former on the latter may go either way, depending on several ingredients: the relative importance of sector-specific vs. global shocks in macroeconomic dynamics, the similarity between countries' production patterns, and the degree of commonality of aggregate shocks.

If business cycles are driven mostly by sector-specific shocks, the impact of greater economic integration on business cycle synchronization depends on the trade and specialization patterns of the countries under consideration. The more similar their

specialization patterns, the more likely that increased trade will result in increased synchronization.

Thus, business cycle synchronization could actually fall following a free trade agreement if the latter leads countries to higher specialization, and this is more likely to happen if the participating countries engage mostly in *horizontal inter-industry* trade.<sup>3</sup> If instead the pattern of trade among participating countries is mainly of *intra-industry* type, then greater economic integration is likely to lead to a higher synchronization of their business cycles. This result is also likely to arise if total trade involves significant *vertical inter-industry* trade, i.e., if the economies specialize in different stages of a common production process, for example through outsourcing, in which case trade integration effectively links the various stages of production across countries.<sup>4</sup>

This means that the effects of trade agreements on business cycle correlation depend on the intrinsic characteristics of participating countries and on the nature of their trade relationships. Even if trade intensity and business cycle correlation are positively related in a sample of industrialized countries, whose trade is mainly of intra-industry type, such result could be driven by the similarity of their factor endowments and the limited scope for further specialization from trade. On these grounds, one would expect to find less of a positive effect of integration on synchronization in an FTA involving both industrial and developing economies like NAFTA, whose members differ substantially in terms of factor endowments, unless trade among them is mostly intra-industry (or vertical inter-industry) in character.<sup>5</sup>

On the other hand, if business cycles are dominated by aggregate shocks, the deciding factor is the impact of trade integration on the correlation of shocks across countries. In most scenarios the impact is likely to be positive, as increased trade will facilitate the transmission of aggregate disturbances across economies, and thus we would expect to observe a more synchronized business cycle as a result of greater economic integration.<sup>6</sup> Assume, for example, that aggregate disturbances reflect mostly demand shocks. In such case, a positive (negative) shock in one country will increase (decrease) demand for goods produced in other countries, so that the shock will spill over to other countries. The magnitude of such spillover will obviously depend on the intensity of trade among the participating countries.

In addition to demand spillovers, there are other possible channels through which greater economic integration may increase business cycle correlation. For example, the process of trade integration could lead to faster diffusion and transmission of productivity, knowledge and technological shocks, as well as to stronger foreign direct investment links across countries.<sup>7</sup> All of these elements should enhance business cycles synchronization among the countries involved in the process of integration.

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<sup>3</sup> See Eichengreen (1992), Kenen (1969), and Krugman (1993).

<sup>4</sup> See Feenstra and Hanson (1996) and Kose and Yi (2001).

<sup>5</sup> This was apparently the case for Mexico-U.S. trade even before NAFTA. See Esquivel (1992).

<sup>6</sup> See Frankel and Rose (1998).

<sup>7</sup> Some of these aspects have been emphasized by, among others, Coe and Helpman (1995).

These factors contribute to raise synchronization by reducing the idiosyncratic component of shocks. Thus, other forces that likewise increase the commonality of shocks across countries tend to have the same effect. For example, policy shocks are a significant source of cyclical fluctuations, and therefore the increase in synchronization will be even larger if the process of trade integration is accompanied by a greater degree of macroeconomic policy coordination among countries.

So far we have focused on trade integration, but financial integration also matters for business cycle co-movement. Like with trade integration, however, its effects are not clear cut and depend on the role of idiosyncratic vs. common shocks. In theory, capital market integration should facilitate risk sharing and hence encourage higher specialization across countries by insuring them against asymmetric shocks (Kalemli-Ozcan, Sorensen and Yosha 2001). A higher degree of specialization would in turn leave countries more exposed to idiosyncratic shocks and reduce the co-movement of production across economies – but increase that of income and consumption as countries would tend to hold similarly diversified asset portfolios.

On the other hand, financial integration facilitates international transmission of aggregate financial shocks. Increased openness to capital flows makes local interest rates and financial asset prices more responsive to world financial conditions, as the extensive literature on ‘contagion’ has argued. The likely consequence is an increase in aggregate co-movement across countries.

### *2.2.3 International Evidence*

The empirical literature on the impact of trade integration on macroeconomic synchronization includes both studies of the relationship between trade intensity and business cycle correlation and case studies that analyze the effect of specific trade agreements or economic integration processes on business cycle synchronization.

The evidence from industrial countries is mostly supportive of a positive effect of integration on macroeconomic synchronization. For example, Frankel and Rose (1998), using a sample of twenty industrialized countries over thirty years, find strong evidence that greater trade links increase business cycle correlation. A number of other studies using a similar methodology find in most cases the same results, in some cases highlighting the contribution of intra-industry trade to the positive integration - synchronization link.<sup>8</sup> However, Imbs (1999, 2000) finds that cycle synchronization is

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<sup>8</sup> Artis and Zhang (1995) find that European economies were highly correlated with the US from 1961-1979 but more with Germany since joining the ERM. Fidrmuc (2001) uses a sample that includes Central and Eastern European countries, and adds the level of intra-industry trade as an explanatory variable, finding that it has a positive and significant effect on the correlation of business cycles. Fontagné and Freudenberg (1999) find the same results as FR looking at more disaggregated trade data for the European Union. Anderson, Kwark and Vahid (1999) again find similar results using more sophisticated measures of co movement. Finally, Gruben, Koo and Mills (2002), who separate out effects of specialization and intra-industry trade, also find similar results, although the positive effect of trade intensity on business cycle correlation is slightly lower than previous estimates.

more responsive to similarities in the structure of production than to trade intensity, suggesting that sector-specific shocks are an important part of the story.

Another group of studies sheds light on the experiences of Ireland, Portugal and Spain from accession to the EEC/ EU (see **Box 1**). They suggest that the main force behind the observed increase in the correlation of the business cycles of these countries with the rest of the EU was deeper trade integration rather than common policies such as the ERM. Synchronization increased first in the tradable goods sector, and only later in the rest of the economy.

As already noted, however, these findings from industrial countries do not carry over automatically to developing countries, for a variety of reasons. Among industrial countries, intra-industry trade accounts for a larger fraction of total trade than in developing countries, production structures are more similar, and common and/or global shocks likely play a bigger role. In fact, the empirical evidence on the effects of trade integration between industrial and developing countries, or among the latter, points to smaller effects on business cycle correlation. The most comprehensive study is that of Calderón et al. (2002), who explore the issue in a sample of 147 countries during the period 1960-1999. For the case of trade relationships between developing and developed countries, they find that higher trade intensity is associated with higher business cycle correlation, although the magnitude of the effect is about one-third of that found in the case of industrialized countries. The effect of trade intensity on business cycle correlation among developing countries is even smaller.<sup>9</sup>

## **2.3 NAFTA and macroeconomic synchronization**

We turn to assessing the changes in the degree of macroeconomic synchronization between Mexico and its NAFTA partners. We first assess if the contemporaneous correlation of key macroeconomic variables among NAFTA countries has increased in recent years relative to historical levels, and then we look for significant changes in the sensitivity of Mexican variables with respect to their U.S. counterparts in the past few years. We also provide a rough assessment of changes in the role of U.S. shocks in Mexico's output performance. For reasons of space, here we just summarize the main results; additional experiments are described in Cuevas et al (2002).

### *2.3.1 Methodological approach*

We work with annual growth rates of the variables of interest (derived from quarterly or monthly frequency data) at various levels of aggregation (national, sector,

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<sup>9</sup> Evidence from case studies is even more mixed. For example, Achy and Milgram (2001) argue that a free trade agreement between Morocco and the European Union is very likely to lead to higher specialization in Morocco and, therefore, to a less-synchronized business cycle between them. Ahumada and Martirena-Mantel (2001) replicate the Frankel-Rose analysis for a sample of Mercosur countries plus Chile. They find suggestive evidence that higher trade has led to higher co-movement, but their results are largely driven by the change in correlation between Argentina and Brazil from 1987-1992 to 1993-1999. The correlations Argentina-Uruguay, Brazil-Uruguay, Argentina-Chile, Brazil-Chile and Chile-Uruguay change little between both periods and in some cases fall in the second period.

and regional). We use two basic methods. First, we compare the contemporaneous correlations between the different variables computed over the longest possible time period, depending on data availability, with those computed over a shorter time period meant to capture the effect of NAFTA. This allows us to observe: i) in the case of international comparisons, if the correlation between the Mexican and U.S. variables has increased more than that between other countries and the U.S.; and ii) when using sector-wise (or regional) information, if the correlation between Mexican and U.S. sectors (regions) has increased more in those cases where we would expect a larger effect from NAFTA.<sup>10</sup>

The second method involves basic regression analysis. We regress the annual growth rate of the Mexican variable of interest against its lagged value and current and lagged values of its U.S. counterpart. The general form of the regressions is:

$$\Delta x_{it} = \mathbf{a}_i + \mathbf{b}_i \Delta x_{it-1} + \mathbf{g}_i \Delta x_{US_t} + \mathbf{m}_i dT + \mathbf{l}_i dT \cdot \Delta x_{it-1} + \mathbf{d}_i dT \cdot \Delta x_{US_t} + \mathbf{e}_{it} \quad (1)$$

where  $\Delta x_{it}$  is the annual growth rate of variable  $x$  in country, region or sector  $i$ ,  $\Delta x_{US_t}$  is the annual growth rate of the same variable in the U.S. (or the partner country under consideration), and  $dT$  is a time dummy to capture changes in the sensitivity of the variable to developments in the U.S. after year  $T$ .<sup>11</sup> While the equation as written allows only for one lag of the dependent variable, longer lag structures were also explored; however, unlike the first lag of the dependent variable, which was virtually always highly significant, additional lags of the dependent and independent variables proved generally insignificant.

There are two options for the dummy variable  $dT$ . The first option sets it equal to one from 1994 to the end of the sample, and zero for previous periods. The second sets it at one from 1997 on. The logic of the latter specification is that, although NAFTA was implemented in 1994, the large balance of payments crisis that took place in Mexico in 1995 and the fast subsequent recovery in 1996 are large shocks, presumably unrelated to NAFTA, which might make it more difficult to find any significant effects from the trade agreement. Below we will report results using both specifications.<sup>12</sup>

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<sup>10</sup> In addition, time-varying contemporaneous correlations were also computed, along with cross-correlations at various leads and lags to verify if the timing of co-movement between the variables of interest has changed; see Cuevas et al. (2002). Finally, factor analysis was also used to tackle the same questions. Because the methodology is slightly more complex, and because the results are consistent with those obtained with the other two methodologies, we omit the presentation of this analysis. However, it is important to emphasize that the factor analysis results tend to support the conclusions based on the correlations and basic regression analyses.

<sup>11</sup> Note that we also allow for changes in the constant and the degree of inertia of the dependent variable, so that the dummy really allows for general structural change in the equation. This methodology is very similar to that used by Frankel, Schmukler and Serven (2003) to assess how responsive are interest rates under different currency regimes to changes in rates abroad.

<sup>12</sup> As discussed in Cuevas et al (2002), many other specifications were used, and the results obtained were qualitatively similar. Seasonal time dummies were also included, but they were seldom significant and their inclusion did not affect the estimated values of the parameters or their significance.

From these simple regressions we can assess two facts. The first is how sensitive the dependent variable is to developments in the U.S. (as given by  $\gamma$ ). The second is how this sensitivity has changed after time  $T$  (when it is given by  $\gamma+\delta$ ), and if such change is statistically significant.

In addition, however, we also need a measure of the contribution of U.S. (or partner-country) shocks to the variation in the dependent variable. This is of independent interest because even if the responsiveness of the latter to developments in the U.S. (i.e.,  $\gamma$ ) is large, if shocks from the U.S. are sufficiently small their contribution to the total variation could be just marginal.<sup>13</sup> In this regard, neither the simple correlation coefficient between the dependent and the U.S. variable, nor the  $R^2$  of a dynamic regression such as (1), offer the right measure. The simple correlation only captures the contribution of changes in the independent variable to contemporaneous changes in the dependent variable,<sup>14</sup> while the  $R^2$  from equation (1) is likely to be dominated by the explanatory power of the lagged dependent variable.

If we are interested in the contribution of current *and* past changes in the U.S. variable to the variation in the dependent variable, then a better measure is obtained by solving the dynamic equation (1) to express the current value of the dependent variable in terms of current and past random errors and the entire history of the explanatory variable. The fraction of the variation in the dependent variable attributable to such history is what we take as our measure of the total contribution of U.S. shocks to the observed variation of the left-hand side variable. We gauge the change in this contribution over time by comparing such measure as calculated in a regression covering the pre-NAFTA years with that obtained from another regression estimated on the post-NAFTA sample.<sup>15</sup>

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<sup>13</sup> To be specific, let  $\Delta x_{it} = \mathbf{a}_i + \mathbf{g}_i \Delta x_{US_t} + \mathbf{e}_t$ , and let  $\mathbf{s}_{US}^2$  and  $\mathbf{s}_e^2$  denote respectively the variance of the U.S. variable and the residual error term. Define  $\mathbf{q} = \mathbf{s}_e / \mathbf{s}_{US}$ , which captures the relative

importance of idiosyncratic relative to U.S. shocks. Then it follows that  $R^2 = \frac{\mathbf{b}^2}{\mathbf{b}^2 + \mathbf{J}^2}$ , and therefore

the variance ratio  $\mathbf{q}$  and the sensitivity coefficient  $\mathbf{b}$  affect  $R^2$  in opposite directions.

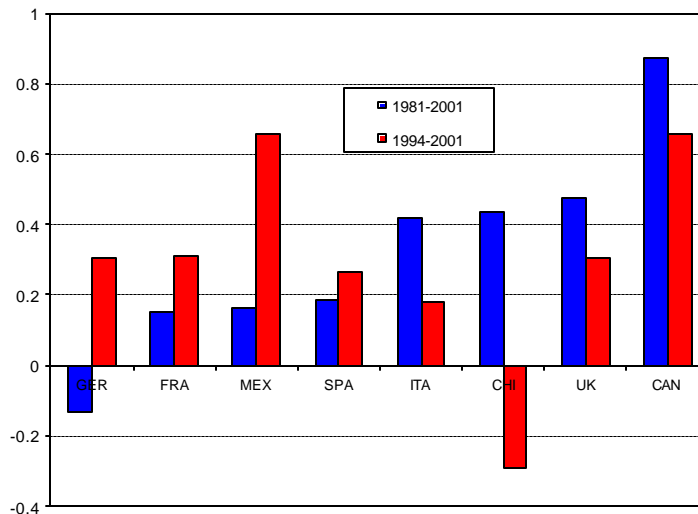
<sup>14</sup> Note that the contemporaneous correlation coefficient equals the square root of the unadjusted  $R^2$  from a simple static regression with no dummies, such as that in the preceding footnote.

<sup>15</sup> Formally, let  $L$  denote the lag operator and, assuming  $dT = 0$  for simplicity, rewrite equation (1) as  $\Delta x_{it}(1 - \mathbf{b}_i L) = \mathbf{a}_i + \mathbf{g}_i \Delta x_{US_t} + \mathbf{e}_t$ . Then we can use the final form of the equation to compute  $Var[\Delta x_{it}] = \mathbf{g}_i^2 Var[(1 - \mathbf{b}_i L)^{-1} \Delta x_{US_t}] + (1 - \mathbf{b}_i^2)^{-1} \mathbf{s}_e^2$ , and the measure proposed in the text is just given by  $1 - (1 - \mathbf{b}_i^2)^{-1} Var[\Delta x_{it}]^{-1} \mathbf{s}_e^2$ . Note that if the past histories of the independent variable and the disturbances are not orthogonal, in effect we are attributing their correlation to the former. Note also that if there is no persistence at all (so that  $\mathbf{b} = 0$  and  $\Delta x_{US}$  is serially uncorrelated), this expression reduces to the square of the contemporaneous correlation coefficient. Except in this case, however, the two statistics differ. Finally, to adjust for varying sample size between the pre- and post-NAFTA years, we apply to this measure the standard degrees-of-freedom correction used to compute adjusted  $R^2$ .

### 2.3.2 NAFTA and macroeconomic synchronization: aggregate output

We first measure the degree of output synchronization among the economies of Mexico, the U.S. and Canada, and compare it to that observed between them and other countries in Europe and Latin America.<sup>16</sup> Figure 2 shows the correlation of annual GDP growth of various countries with that of the U.S. during the periods 1981Q1-2001Q2 and 1994Q1-2001Q2. In the longer sample, the correlation coefficient between Canada and the U.S. is by far the highest, followed by those of the United Kingdom, Chile and Italy. Mexico's correlation is positive, but much lower. However, in the shorter, more recent time period, Mexico and Canada share the top spot, with a correlation coefficient with the U.S. of 0.66,<sup>17</sup> much higher than the values for the other industrial countries shown in the table.

**Figure 2. Correlation of Annual GDP Growth with the U.S.**

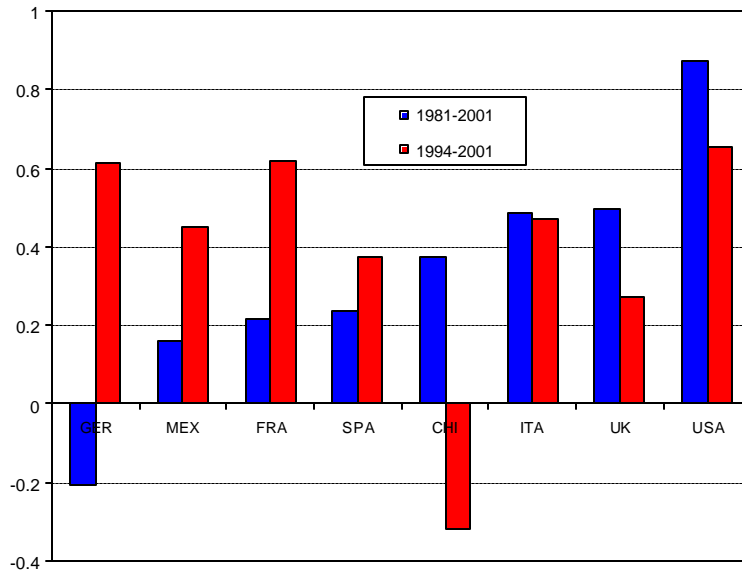


It is also interesting to note that the correlation between Canada and Mexico in the shorter period is substantially higher than for the whole sample (Figure 3). However, Canada's correlation with several European countries is higher than that with Mexico. Other results (not shown in the figure) also reveal an increase in the correlation of Mexico's output with most European economies in the sample, though the increase is much smaller than for the correlation with the U.S. This phenomenon is consistent with the general opening up to trade followed by Mexico since the mid-eighties.

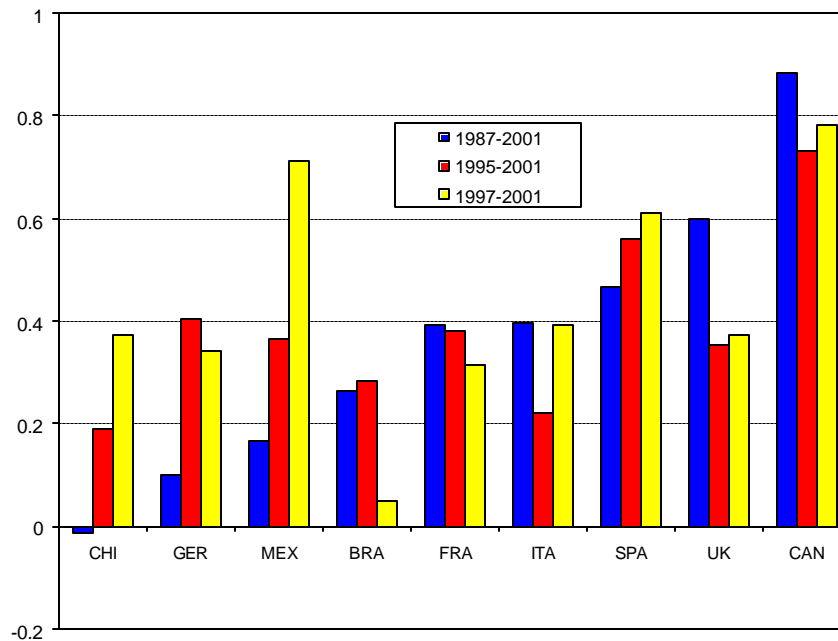
<sup>16</sup> The data employed are annual rates of growth of GDP (at quarterly frequency) and of industrial production (at monthly frequency). The source of the data for all countries is the IMF, with the exception of the industrial production of Chile, which proceeds from domestic sources.

<sup>17</sup> These turn out to be also the highest correlation coefficients of these two countries with any other country in the sample; see Cuevas et al (2002). In turn, the somewhat surprising negative correlation between the U.S. and Chile in the recent sample is discussed by Morandé and Schmidt-Hebbel (2000).

**Figure 3. Correlation of Annual GDP Growth with Canada**



**Figure 4. Correlation of Industrial Production Growth with the U.S.**

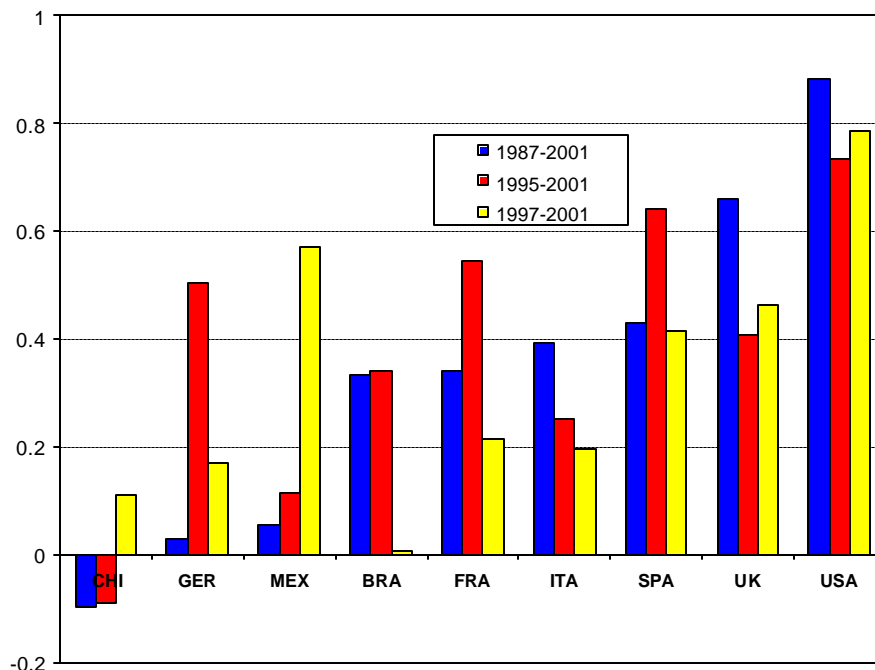


Results using industrial production growth broadly confirm those based on GDP growth. Figure 4 shows the correlation coefficients of industrial production growth in various countries with that of the U.S. during the periods 1987–2001, 1995–2001 and 1997–2001. The countries showing the largest correlation with the U.S. during the longer sample period are Canada and the United Kingdom. At the other extreme are Chile,

Mexico and Germany, all with correlation coefficients below 0.2. The differences between these results and those for the period 1995-2001 are generally small, with the correlation falling for some countries and increasing for others but in most cases by a relatively small magnitude. However, the differences between the full-sample results and those for the 1997-2001 sample are more striking. Most importantly, Mexico's industrial output correlation with the U.S. increases to a level similar to Canada's. Like with GDP, the correlation with the U.S. rises for several countries, but Mexico's increase is clearly the largest. Further, Figure 5 shows that Mexico's industrial production has also become much more tightly correlated with that of Canada in the recent period, a phenomenon unique among the countries shown in the figure.

So far these results indicate that in the post-NAFTA period output in Mexico and its NAFTA partners have tended to move in the same direction and at the same time to a greater extent than in the pre-NAFTA years. In principle, this could reflect the occurrence of larger common shocks, relative to idiosyncratic shocks to these countries, without any increase in the Mexico's sensitivity to developments in its NAFTA partners, or an increased sensitivity without changes in the structure of shocks, or both at the same time.

**Figure 5. Correlation of Industrial Production Growth with Canada**



To assess the changes in the sensitivity of Mexican variables to developments in the U.S., we turn to the simple regressions described in equation (1) above.<sup>18</sup> Table 1

<sup>18</sup> The regressions were estimated using annual growth rates of GDP and industrial production for each country. For those countries where the data allows it, the regressions cover the period 1981-2001 in the

shows estimates of the sensitivity parameters  $g$  and  $d$  from equation (1) using GDP growth data, for the two choices of post-NAFTA period (starting in 1994 and 1997, respectively). As explained above,  $g$  indicates the sensitivity to changes in the U.S. variable before the break date, whereas  $g+d$  represents the sensitivity after that date.

**Table 1 Annual Growth Rate of GDP**

Sensitivity Coefficients Before and After NAFTA								
a. Dummy 1994								
Country	g	d	g+d	AdjR2	Fraction explained by U.S. shocks			
					Before 1994	After 1994	Difference	
Canada	<b>0.65</b>	-0.13	<b>0.52</b>	0.89	0.85	0.72	-0.13	
Mexico	<b>0.28</b>	<b>1.35</b>	<b>1.63</b>	0.66	-0.03	0.48	0.50	
Brazil	<b>-1.03</b>	<b>1.63</b>	0.60	0.32	0.01	-0.10	-0.11	
Chile	<b>0.56</b>	-0.63	-0.07	0.75	0.39	-0.05	-0.44	
France	0.04	<b>0.24</b>	<b>0.29</b>	0.75	0.13	0.16	0.03	
Germany	-0.04	0.37	0.33	0.71	-0.01	0.05	0.05	
Italy	<b>0.10</b>	0.23	<b>0.32</b>	0.64	0.37	-0.23	-0.59	
Spain	-0.02	<b>0.34</b>	<b>0.31</b>	0.81	-0.06	0.01	0.06	
UK	0.05	0.13	0.17	0.80	0.47	0.06	-0.42	
b. Dummy 1997								
Country	g	d	g+d	AdjR2	Fraction explained by U.S. shocks			
					Before 1997	After 1997	Difference	
Canada	<b>0.63</b>	-0.19	<b>0.44</b>	0.89	0.84	0.74	-0.10	
Mexico	<b>0.31</b>	0.71	<b>1.03</b>	0.64	-0.01	0.36	0.37	
Brazil	-0.09	0.19	0.09	0.09	-0.08	-0.11	-0.03	
Chile	<b>0.53</b>	-0.37	0.16	0.75	0.37	-0.15	-0.52	
France	0.07	0.06	0.13	0.73	0.18	0.47	0.30	
Germany	-0.03	0.44	0.41	0.71	0.03	-0.26	-0.29	
Italy	<b>0.10</b>	<b>0.33</b>	<b>0.43</b>	0.65	0.33	0.08	-0.25	
Spain	-0.01	0.08	0.07	0.85	0.29	-0.14	-0.44	
UK	0.06	0.09	0.14	0.81	0.49	0.01	-0.48	

Note: The parameter estimates correspond to the empirical specification given by equation (1) in the text. Coefficients in **bold** are significantly different from 0 at the 10 percent level or better. The parameter  $\gamma$  represents the sensitivity coefficient to developments in the U.S. before period T (either 1994 or 1997) and the sum of  $\gamma$  plus  $\delta$  indicates the sensitivity coefficient after period T. The measures of the contribution of U.S. shocks are described in the text. They are obtained from separate regressions on the sub samples before and after T, and are adjusted for degrees of freedom.

The coefficient estimates in the table show considerable diversity across countries. In both specifications shown, all countries except Canada and Chile exhibit increases in their sensitivity coefficients, although few of them are statistically significant. Mexico's coefficient rises substantially in the post-NAFTA period, although the increase is significant only when 1994 is taken as the break year. Mexico is also the country exhibiting the largest post-NAFTA sensitivity coefficient, which in both

case of GDP and 1987-2001 for industrial production. For countries with shorter data series, the sample starts with the first available observation.

specifications is greater than 1. Canada's coefficient, the second largest, is less than half that of Mexico. Thus, not only is Mexico's GDP becoming more sensitive to variations in U.S. output, but it also responds more than proportionately to changes in the latter.

The  $R^2$  from these regressions are in general quite high, with the exception of Brazil's. Yet they reflect to a large extent the action of lagged growth, and to gauge the contribution of U.S. growth to the observed variation in growth in the other countries we turn to the last three columns of the table. These report the estimated contribution of U.S. growth over the pre- and post-break sample periods, as measured by the  $R^2$ -like statistic described earlier.

**Table 2 Annual Growth Rate of Industrial Production**

Sensitivity Coefficients Before and After NAFTA							
a. Dummy 1994							
Country	g	d	g+d	Adj R2	Fraction explained by U.S. shocks		
					Before 1994	After 1994	Difference
Canada	<b>0.37</b>	0.04	<b>0.41</b>	0.91	0.93	0.68	-0.25
Mexico	0.00	0.15	0.14	0.59	-0.01	0.08	0.09
Brazil	0.08	0.28	0.36	0.42	-0.02	0.09	0.12
Chile	0.02	0.08	0.10	0.71	-0.01	0.05	0.06
France	0.07	0.10	<b>0.17</b>	0.73	0.04	0.22	0.19
Germany	0.02	<b>0.36</b>	<b>0.38</b>	0.69	-0.03	0.21	0.24
Italy	<b>0.27</b>	0.17	<b>0.45</b>	0.49	0.14	0.19	0.05
Spain	0.06	0.12	<b>0.19</b>	0.81	0.01	0.30	0.29
UK	<b>0.41</b>	<b>-0.33</b>	0.08	0.77	0.64	0.33	-0.31

b. Dummy 1997							
Country	g	d	g+d	Adj R2	Fraction explained by U.S. shocks		
					Before 1997	After 1997	Difference
Canada	<b>0.32</b>	<b>0.24</b>	<b>0.56</b>	0.91	0.82	0.76	-0.06
Mexico	-0.01	<b>1.15</b>	<b>1.14</b>	0.59	-0.01	0.61	0.61
Brazil	0.37	-0.24	0.13	0.41	0.05	-0.02	-0.07
Chile	0.03	0.03	0.06	0.72	-0.01	0.07	0.07
France	<b>0.11</b>	-0.01	0.10	0.73	0.13	0.20	0.07
Germany	0.03	0.31	<b>0.34</b>	0.69	-0.01	0.12	0.13
Italy	<b>0.23</b>	0.24	<b>0.47</b>	0.48	0.12	0.25	0.13
Spain	0.09	0.20	<b>0.29</b>	0.81	0.16	0.37	0.20
UK	<b>0.27</b>	-0.08	<b>0.19</b>	0.76	0.57	0.51	-0.06

Note: The parameter estimates correspond to the empirical specification given by equation (1) in the text. Coefficients in **bold** are significantly different from 0 at the 10 percent level or better. The parameter  $\gamma$  represents the sensitivity coefficient to developments in the U.S. before period T (either 1994 or 1997) and the sum of  $\gamma$  plus  $\delta$  indicates the sensitivity coefficient after period T. The measures of the contribution of U.S. shocks are described in the text. They are obtained from separate regressions on the sub samples before and after T, and are adjusted for degrees of freedom.

By this measure, both specifications yield fairly similar conclusions regarding the role of U.S. shocks. These account for the bulk of the variation in growth in Canada, and for a fair share in the U.K. and Chile in the early part of the sample as well. In these two

countries, however, the contribution of U.S. shocks declines sharply in the later years. In contrast, U.S. shocks appear wholly unimportant for Germany and Brazil in all samples and specifications. Importantly, Mexico is the country exhibiting the largest increase in the role of U.S. shocks under both specifications shown. In the later sample, U.S. growth accounts for between one-third and one-half of the variance of Mexico's growth. Only Canada (as well as France when the sample is broken in 1997) shows a larger figure.

Table 2 shows similar regressions of the annual growth rate of industrial production, using monthly data for 1987-2001. Like with GDP, most countries exhibit increasing sensitivity coefficients, but few of the changes are significant. Mexico shows a large jump when the break year is 1997; in such specification, it again exhibits the largest post-NAFTA sensitivity coefficient, as before exceeding 1. The last three columns in the table show that the explanatory power of U.S. industrial production rises in all countries, except for Canada and the U.K. As before, the explanatory power is greatest for Canada. In the early samples U.S. shocks appear to play a very marginal role in the observed variation in Mexico's growth, but in the post-1997 sample they become a major factor – they account for 61 percent of the variation, a figure that exceeds even that of the U.K., and is second only to Canada's.

#### **2.4 NAFTA and output synchronization: the disaggregated view**

There are two potentially important dimensions of synchronization that may be masked in the aggregate data. The first one is the geographic one. Have all regions of Mexico experienced a similar increase in the importance of U.S. developments as a source of growth variation? To answer this question, we explored regional employment growth data. The results from this analysis, described in detail in **Box 2**, show that the Southern states of Mexico have been a clear exception to the general trend.

The other dimension refers to the economic sector level. If increased synchronization is indeed a result of deepening trade integration, we should expect a more marked increase in the degree of synchronization of tradable goods sectors than in other sectors. We investigate this hypothesis using quarterly GDP measures for Canada and Mexico and national gross income data for the U.S., at the 1-digit sector level, as well as monthly industrial production at the 2-digit level for Mexico and the U.S.<sup>19</sup>

Table 3 shows correlation coefficients of sector-wise growth rates in Mexico and Canada with the corresponding U.S. sector, for the periods 1988-2001, 1994-2001 and 1997-2001. In the full sample, the correlation between U.S. and Canadian sectors is generally larger than that between the U.S. and Mexican sectors, with Transport and Communications as the only exception. Indeed, the correlations of US sectors with Mexican sectors are relatively low during the whole period 1988-2001. However, a more detailed look at the period after NAFTA, and specially after the 1995-96 balance of

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<sup>19</sup> Comparable industrial production data were unavailable for Canada. The sources for the data are: INEGI, CANSIM and BEA for Mexico, Canada, and the USA, respectively. The sample period used for the quarterly data is 1988Q1 – 2001Q2, while that for the monthly data is 1980M1 – 2001M11. Both sample periods are determined by the availability of data.

payments crisis, shows that the correlation between Mexican and U.S. sectors increased significantly in several cases, in some of them to reach (or even exceed) the levels observed for Canada. In particular, the correlation increased quite noticeably for manufacturing, transport and communications, and general services. In contrast, it remains quite low for agriculture, construction and financial services.

**Table 3 Growth correlation between Canada, Mexico and the U.S. by sector of economic activity**

	1988-2001		1994-2001		1997-2001	
	Canada	Mexico	Canada	Mexico	Canada	Mexico
Agriculture	0.135	-0.005	0.167	0.086	0.409	0.265
Mining	0.589	0.392	0.645	0.451	0.753	0.489
Manufactures	0.657	0.112	0.779	0.169	0.890	0.867
Construction	0.604	0.031	0.125	0.489	-0.542	0.137
Transportation and Communications	-0.031	0.240	0.296	0.399	0.150	0.619
Electricity, Gas and Water	0.241	0.024	0.575	0.184	0.705	0.387
Financial Services	-0.155	-0.189	-0.120	-0.118	0.332	0.186
Social, Communal and Personal Services	0.322	-0.056	0.513	0.423	0.145	0.635

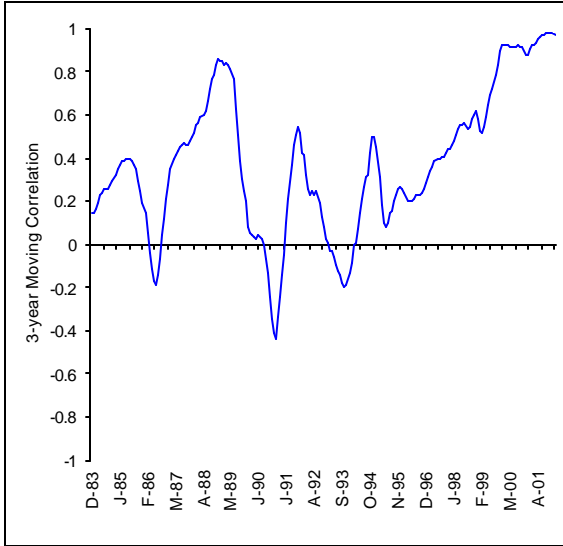
**Table 4 Growth correlation between Canada, Mexico and the U.S. by industrial sector**

	Correlation between Mexico and USA		
	1981-2001	1994-2001	1997-2001
Total	0.316	0.519	0.968
Mining	0.366	0.368	0.432
Electricity, Gas and Water	-0.141	-0.179	0.054
Manufacturing	0.284	0.619	0.970
Food and Beverages	0.014	0.100	0.328
Textiles	-0.039	0.371	0.790
Wood industries	0.020	0.316	0.344
Paper and Editorials	0.083	0.511	0.748
Chemical Products	0.098	0.572	0.691
Minerals	0.071	0.499	0.636
Basic Metals	0.561	0.520	0.766
Machinery	0.396	0.501	0.832
Other Manufacturing Industries	0.166	0.199	0.504

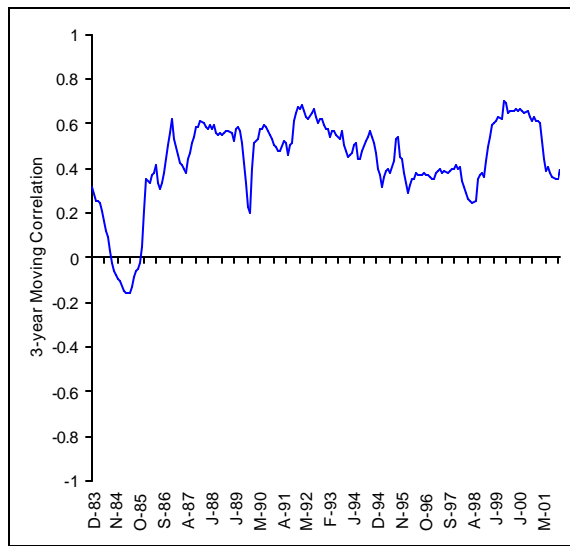
Comparing the full-sample correlation coefficients between Mexican and U.S. sectors with those obtained in the more recent periods, it can be seen that the latter are larger than the former in every instance, and in all cases but one they are larger in the latest part of the period (1997-2001). In contrast, U.S.-Canada correlation coefficients fall in some cases during the latter part of the sample. In fact, the pattern of correlation coefficients across Mexican sectors does not seem to support the view that these should rise more sharply for traded sectors, since the second largest increase, as well as the second largest coefficient in the 1997-2001 period, correspond to the Services sector.

**Figure 6 Three year moving correlation coefficients between growth rates of components of industrial production in Mexico and the U.S.**

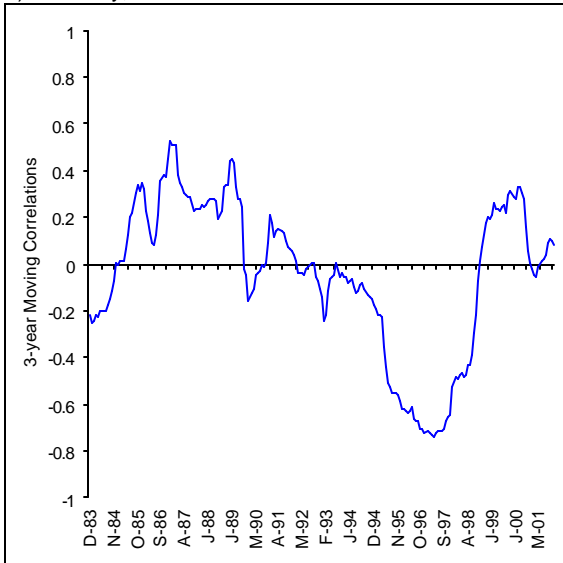
i) Total Industrial Production



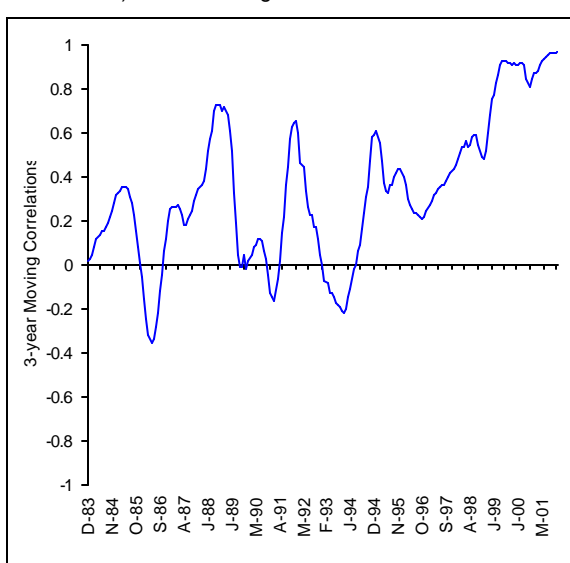
ii) Mining



iii) Electricity, Gas and Water



iv) Manufacturing



We can dig one level deeper by examining the patterns of growth correlation by industrial sector. This is done in Table 4, which shows the correlation of industrial production growth and its components between Mexico and the U.S. for the whole sample period 1981-2001 and for the sub-periods 1994-2001 and 1997-2001. The table shows a significant increase in the correlation of total industrial production, driven mostly by manufacturing. Within manufacturing, the increase in correlation is particularly large for paper and editorials, chemical products, mineral based products,

textiles and machinery. However, except for the latter sector (plus perhaps textiles), none of these was particularly export-oriented in the pre-NAFTA years.

Figure 6 shows three-year moving correlation coefficients between the growth rate of industrial production components in Mexico and the U.S.. In the case of total industrial production, the correlation during the first part of the sample fluctuates until 1994, when it begins a steady increase that lasts through the end of the sample period. Manufacturing shows the same pattern. In turn, mining exhibits a moderately positive correlation coefficient throughout the whole period, whereas in utilities (electricity, gas and water), a nontradable sector, the correlation fluctuates without a clear pattern.

**Table 5 Annual Growth Rate of Industrial Production by Sector**

Sensitivity Coefficients Before and After NAFTA								
a. Dummy 1994								
Country	g	d	g+d	Adj R2	Fraction explained by U.S. shocks			
					Before 1994	After 1994	Difference	
Total	<b>0.17</b>	<b>-0.16</b>	0.01	0.92	0.30	-0.12	-0.42	
Mining	<b>0.13</b>	0.20	<b>0.33</b>	0.51	0.17	0.12	-0.05	
Elec, Gas & Water	0.03	-0.02	0.02	0.56	-0.04	-0.05	-0.01	
Manufacturing	<b>0.13</b>	-0.07	0.06	0.88	0.05	0.21	0.15	
Food & Bev	-0.11	0.16	0.05	0.15	-0.02	-0.02	0.00	
Textiles	<b>-0.32</b>	<b>0.53</b>	0.21	0.36	0.08	0.09	0.01	
Wood	-0.08	<b>0.54</b>	<b>0.46</b>	0.15	-0.01	0.08	0.09	
Paper	-0.20	<b>0.79</b>	<b>0.59</b>	0.23	0.00	0.24	0.24	
Chemical	0.02	<b>0.75</b>	<b>0.77</b>	0.36	0.00	0.31	0.32	
Minerals	0.06	0.27	<b>0.33</b>	0.70	-0.04	0.29	0.33	
Basic Metals	<b>0.19</b>	-0.12	0.07	0.66	0.38	0.11	-0.27	
Machinery	<b>0.26</b>	-0.10	0.16	0.75	0.16	0.23	0.07	
Other	<b>0.39</b>	-0.09	0.30	0.29	0.04	0.01	-0.03	

b. Dummy 1997								
Country	g	d	g+d	Adj R2	Fraction explained by U.S. shocks			
					Before 1997	After 1997	Difference	
Total	<b>0.14</b>	<b>0.50</b>	<b>0.64</b>	0.92	0.18	0.93	0.75	
Mining	<b>0.15</b>	0.09	0.24	0.50	0.14	0.20	0.06	
Elec, Gas & Water	0.02	0.07	0.08	0.56	-0.03	0.01	0.04	
Manufacturing	<b>0.11</b>	<b>0.60</b>	<b>0.72</b>	0.88	0.03	0.94	0.91	
Food & Bev	-0.08	0.38	0.30	0.16	-0.01	0.09	0.11	
Textiles	<b>-0.21</b>	<b>1.46</b>	<b>1.24</b>	0.36	0.04	0.61	0.57	
Wood	-0.03	0.43	0.40	0.14	-0.01	0.10	0.12	
Paper	-0.07	<b>0.87</b>	<b>0.80</b>	0.23	-0.01	0.57	0.58	
Chemical	0.02	<b>1.18</b>	<b>1.20</b>	0.39	0.00	0.47	0.47	
Minerals	0.08	<b>0.45</b>	<b>0.53</b>	0.70	-0.03	0.41	0.44	
Basic Metals	<b>0.17</b>	0.19	<b>0.35</b>	0.66	0.33	0.57	0.24	
Machinery	<b>0.21</b>	0.27	<b>0.48</b>	0.76	0.12	0.69	0.57	
Other	<b>0.36</b>	<b>0.96</b>	<b>1.32</b>	0.32	0.04	0.24	0.20	

Note: The parameter estimates correspond to the empirical specification given by equation (1) in the text. Coefficients in **bold** are significantly different from 0 at the 10 percent level or better. The parameter  $\gamma$  represents the sensitivity coefficient to developments in the U.S. before period T (either 1994 or 1997) and the sum of  $\gamma$  plus  $\delta$  indicates the sensitivity coefficient after period T. The measures of the contribution of U.S. shocks are described in the text. They are obtained from separate regressions on the sub samples before and after T, and are adjusted for degrees of freedom.

Like with the aggregate data, the correlation analysis was complemented with simple regressions of sector-wise GDP growth in Mexico against the corresponding U.S. variable, using a variety of specifications. The results from this exercise<sup>20</sup> show that the sensitivity of Mexico's growth at the 1-digit level to growth in the same sector in the U.S. increased substantially in the past few years, in some cases to exceed the corresponding sensitivity estimates for Canada. Like in the correlation analysis, the sectors exhibiting the highest sensitivity in recent years are Manufacturing, Transport and Communications and Social Services. However, the contribution of U.S. shocks to the variance of growth remains modest even in these sectors, again suggesting that idiosyncratic shocks continue to play a significant role in Mexico in recent years.

Similar exercises were performed for industrial production growth at the 2-digit level of disaggregation. The results are shown in Table 5. The coefficients capturing the post-NAFTA change in sensitivity are positive in most cases, and in every one when the break year is 1997. A number of them are also statistically significant. This occurs in the case of Total Industrial Production, Total Manufacturing, Textiles, Wood Products, Paper and Editorials, Chemical Products, and Minerals. It is also interesting to note that several of the sensitivity coefficients are larger than one, suggesting that industrial output in Mexico reacts more than proportionately to changes in the same sub-sector in the U.S.

In most sectors we also observe an increase in the explanatory power of U.S. growth; indeed, this is the case for every sector in the post-1996 sample. In the latter case, the U.S. accounts for the bulk of the growth variation in Total Industry and Total Manufacturing. In Textiles, Machinery, Paper and Chemicals, U.S. shocks account for around one half of the total variation. In contrast, U.S. factors remain marginal for Mining, utilities, Food and Beverages and Wood Products.

The role of common factors with the U.S. in the variation of industrial output was also explored using factor analysis. Specifically, we compared the patterns of factor loadings between 1988-2001 and 1997-2001. The results were in broad agreement with those reported above.<sup>21</sup> In the former period, there was virtually no instance in which the same sectors in Mexico and the U.S. shared a common factor. In contrast, in the latter period there is strong evidence that most manufacturing sectors in both countries are significantly driven by common shocks.

## **2.5 NAFTA and macroeconomic volatility**

Related to macroeconomic synchronization, another important dimension in which NAFTA also has potentially major implications for Mexico is that of macroeconomic volatility. On the one hand, the nature and extent of volatility in Mexico may change as a result of NAFTA – as suggested by the preceding analysis. On the other hand, macroeconomic volatility itself acquires renewed importance, because it may detract from the benefits of economic integration by holding back the rise in foreign trade

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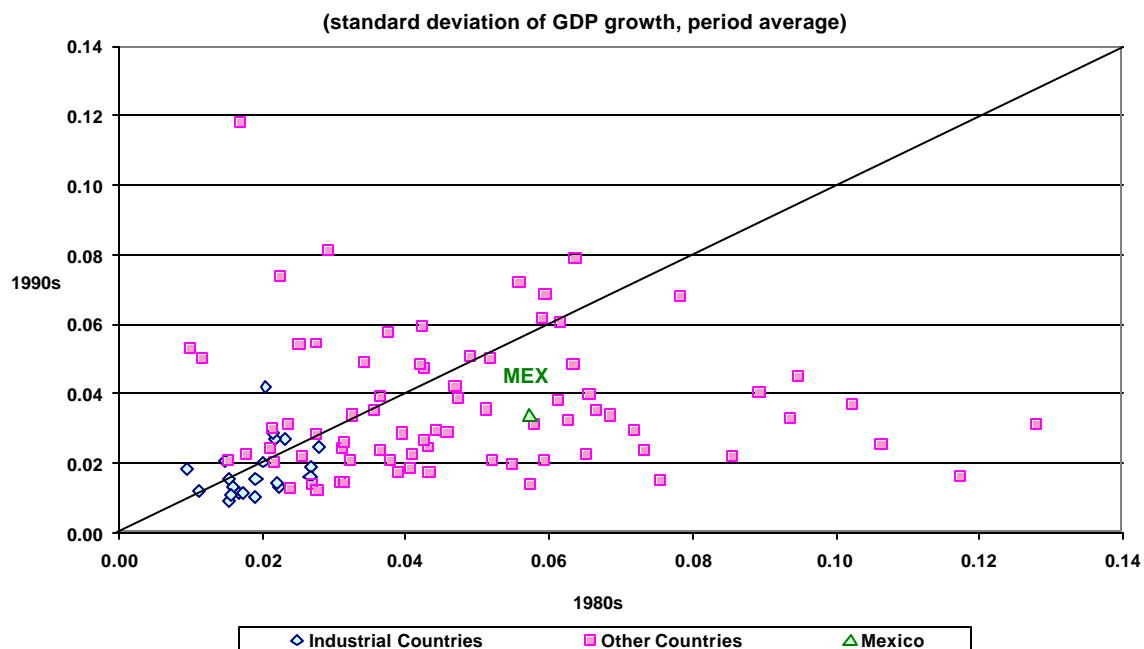
<sup>20</sup> Full details are given in Cuevas et al (2002).

<sup>21</sup> See Cuevas et al (2002) for the details.

and investment flows through which the gains should accrue. This underscores the need for suitable macroeconomic policies to foster macroeconomic stability.

Like most other Latin American economies, Mexico has long been characterized by high macroeconomic volatility, much above the levels observed in industrial countries and successful East Asian economies. Figure 7 presents a comparative perspective on macroeconomic volatility, as measured by the standard deviation of real GDP growth, over the 1980s and 1990s. Three facts emerge from the graph.<sup>22</sup> First, there is a great degree of diversity across countries, but as a rule industrial economies are much less volatile than most developing countries. Second, in the 1990s growth volatility declined in many developing countries relative to the (exceedingly high) levels of the 1980s – most of the data points locate below the 45-degree line. Third, Mexico has shown a considerable improvement: its growth volatility has declined almost by half relative to the previous decade, although it still remains higher than in industrial and East-Asian countries.

**Figure 7 GDP Growth Volatility in the 1980s and 1990s**



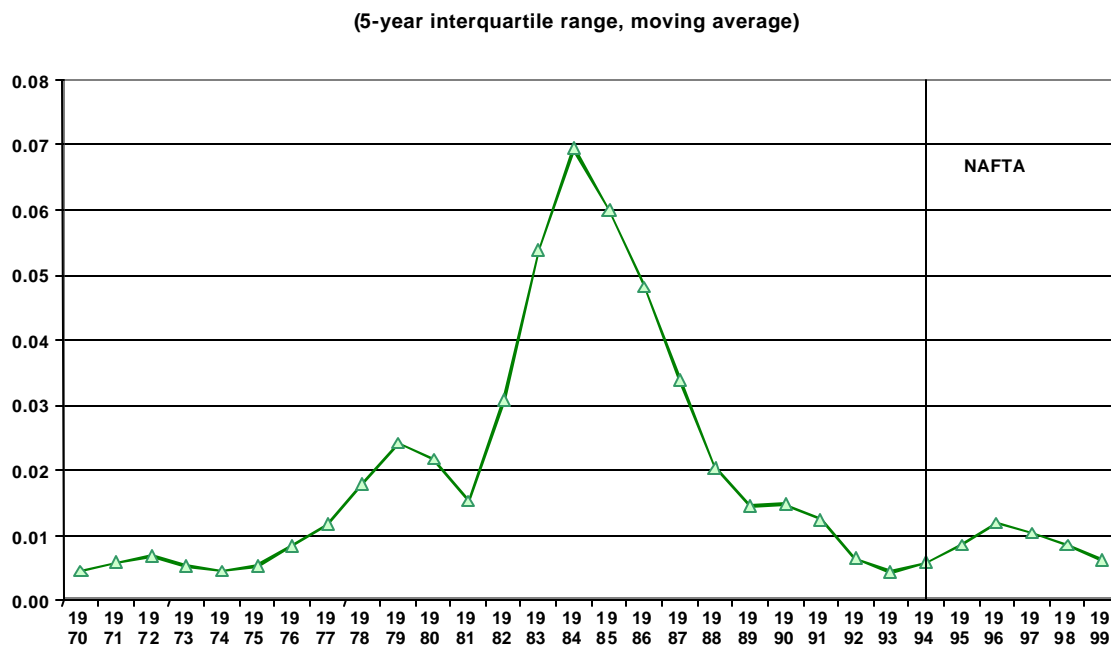
The decline in macroeconomic instability in Mexico is further illustrated in Figure 8.<sup>23</sup> The figure shows that growth volatility rose sharply in the early 1980s, at the time of the debt crisis, and then declined until 1994-96, when the Tequila crisis hit. After 1996, volatility has remained low, but still above the levels of the early 1970s.

<sup>22</sup> The stylized facts regarding macroeconomic volatility are discussed at length in De Ferranti et al (2000).

<sup>23</sup> To limit the effect of extreme annual observations, which lead to large jumps in conventional volatility measures, the figure depicts a 3-period centered moving average of the interquartile range computed over 5 years.

In broad terms, macroeconomic volatility reflects both the action of external shocks – real and financial – and the poor functioning of key shock absorbers, namely inadequate macroeconomic policies and underdeveloped financial systems. Terms-of-trade shocks are more severe for economies whose external trade is heavily concentrated on a few commodities (typically natural resources), and impact more strongly on economies that are very open. Weak financial systems are unable to fulfill their risk-diversification role, and instead tend to amplify shocks, or even generate them.<sup>24</sup> Finally, macroeconomic policy has often played a destabilizing role in Latin America, as monetary policy has been devoted in many countries to inflationary finance of unsustainable fiscal deficits, and fiscal policy has followed a pro-cyclical stance, expanding in booms and contracting in recessions.<sup>25</sup> Indeed, the decline in volatility in Mexico after 1996 surely reflects, among other factors, improved fiscal and monetary policies in recent years.

**Figure 8 Mexico: GDP Growth Volatility over Time**



<sup>24</sup> De Ferranti et al (2000) find that external shocks, poor policies and weak financial systems roughly account for one-third each of Latin America’s “excess volatility” vis-à-vis industrial and East Asian economies over the last quarter century. See also Caballero (2000) for an analysis attributing much of Latin America’s macroeconomic instability to weak domestic and foreign financial links.

<sup>25</sup> The procyclicality of fiscal policy in most developing countries is documented by Talvi and Vegh (2000).

There is ample evidence that volatility deters economic growth, by discouraging both investment and productivity.<sup>26</sup> In the presence of higher macroeconomic volatility, economic agents face greater uncertainty, and this deters them from undertaking fixed investment decisions, because in many cases those decisions cannot be reversed (at least without major costs). Volatility also hampers agents' ability to allocate economic resources in an efficient manner, as the informative content of relative price and profitability signals may be drowned by aggregate instability.

For Mexico, the process of trade opening and the passage of NAFTA may have also direct consequences for macroeconomic volatility. While increased openness could in principle have raised the country's exposure to terms of trade changes, in practice it has been accompanied by an impressive increase in export diversification, which in effect has probably led to reduced terms of trade risk.<sup>27</sup> Much of this diversification has been the result of the trade liberalization process initiated in the late 1980s and the passage of NAFTA in the 1990s. As for the implications for volatility of the increased degree of cyclical synchronization between Mexico and its NAFTA partners described earlier, they are not entirely clear. In principle, greater synchronization with FTA partners does not necessarily imply reduced amplitude of Mexico's cyclical fluctuations. Indeed, some of the empirical results reported earlier appear to suggest that Mexico shows "excess sensitivity" to contemporaneous developments in the U.S. Finally, while volatility has declined in Mexico in recent years, it still remains above that of its NAFTA partners.

Over the medium term, deeper integration with two large stable economies should be expected to lead to reduced instability for Mexico. In fact, it may be argued that the prospect of declining instability as a result of FTA accession is precisely one of the primary reasons why countries join them in the first place, in the hope of locking-in policy reforms in trade and other areas, securing market access, and generally offering a more stable environment for investors.<sup>28</sup>

Do FTAs fulfill these expectations of enhanced stability? The international evidence suggests that they might. A simple comparison of volatility measures in a large time-series cross-country sample,<sup>29</sup> controlling for unobservable country-specific effects, shows that annual GDP growth volatility is over 1 percent lower for those observations (country-years) corresponding to FTA membership than for the rest, and the difference is significant at the 1 percent level. But whether this result can be interpreted as reflecting causation from FTA membership to stability is debatable. For example, it is possible that FTAs happen more often among countries having achieved more stable macroeconomic

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<sup>26</sup> On the negative impact of volatility on growth, see Ramey and Ramey (1995) and Fatás (2000). The adverse impact on investment is amply documented in Servén (1998). Lederman *et al* (2003) provide evidence of this negative effect for the case of Mexico.

<sup>27</sup> De Ferranti *et al* (2002) show that by the late 1990s Mexico had achieved one of the most diversified export baskets in Latin America.

<sup>28</sup> Indeed, NAFTA has very likely changed investors' perceptions about the risk of investing in Mexico, prompting increased investment flows even for a given degree of observed macroeconomic instability. We will return to this issue in Chapter 4 below.

<sup>29</sup> The sample includes 44 countries and 880 observations. The data and the FTAs included are described in detail in Chapter 4.

conditions, in which case this result could reflect reverse causation from stability to FTA membership.

Regardless of whether volatility can be expected to decline in the long run as a result of NAFTA, the treaty makes it an especially pressing concern for Mexico. Much of the gain that the country can achieve from trade integration relies on new foreign investment taking place and on the expansion of external trade. However, macroeconomic volatility may prevent NAFTA from delivering its full benefits – or delay them -- through trade and investment. Indeed, there is compelling international evidence that high volatility discourages foreign investment (and external financing in general), as the appeal of profitable investment opportunities is weakened by high risk derived from the possibility of large swings in relative prices, real exchange rates and other major macroeconomic variables.<sup>30</sup> Likewise, macroeconomic volatility, and specifically real exchange rate variability, deter also foreign trade, as a number of empirical studies have confirmed.<sup>31</sup> Higher real exchange rate uncertainty increases the riskiness of foreign transactions, leading traders to demand higher profits in order to undertake them and thus reducing the volume of trade (Brodsky 1984).<sup>32</sup> Real exchange rate uncertainty also affects the political economy of the integration process, as abrupt swings in real exchange rates may trigger protectionist pressures.<sup>33</sup> Even if the existence of an FTA rules out protectionist measures against partner countries, they may be applied to nonmember countries, leading to trade diversion and reduced gains from trade.

In summary, to enhance the speed and scope of the gains from NAFTA, Mexico's macroeconomic stability is of paramount importance, and macroeconomic policies need to ensure that the declining volatility trend of the late 1990s is maintained. Against this background, the next section turns to the role of policy coordination.

## 2.6 The role of policy coordination

The increased macroeconomic synchronization between Mexico and its NAFTA partners in recent years raises two policy questions. First, is rising synchronization simply a result of the fact that the Mexican authorities have been following policies similar to those of Mexico's NAFTA partners, rather than (or in addition to) an increased incidence of common (non-policy) shocks? Second, looking forward, does Mexico stand to gain from increased policy coordination with its NAFTA partners?

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<sup>30</sup> This is empirically confirmed by Calderón, Loayza and Servén (2002) for the case of overall capital flows, and Albuquerque, Loayza and Servén (2003) for FDI. These studies include as measures of volatility the variability of GDP growth, the real exchange rate, the terms of trade and the inflation rate.

<sup>31</sup> For example, Caballero and Corbo (1989) showed that higher volatility of the real exchange rate reduces exports in a large group of developing countries. More recent empirical studies by Arize et al. (2000) and Dell'Ariccia (1999) find strong evidence of a negative impact of exchange rate volatility on trade flows. These recent studies take specifically into account the endogeneity problems that afflicts most previous literature. Esquivel and Larraín (2002) show that third-party exchange rate volatility, as represented by the volatility of the G-3 currencies, also reduces trade flows of developing countries.

<sup>32</sup> Real exchange rate volatility is also a major deterrent for domestic investment., both in Mexico (Lederman *et al* 2003) and in developing countries in general (Servén 2003).

<sup>33</sup> Recall, for example, the protectionist pressures that arose in Mercosur following Brazil's 1999 devaluation.

Have Mexico's fiscal and monetary policies become more similar to those of the U.S. ? Cuevas et al (2002) examine the correlation between key fiscal and monetary policy indicators of the U.S. and Mexico.<sup>34</sup> For all indicators considered, they find that the correlation is small (or even negative), and in most cases has declined in recent years. Hence, policy synchronization has not risen – which is hardly surprising. Regarding, for example, monetary policy in the post-NAFTA years, in the U.S. it was dictated by local growth forecasts, while in Mexico it was conditioned by the disinflation processes, the 1995 balance of payments crisis, and external financial shocks associated with the Russian and Brazilian crises. Instead, the implication is that synchronization has risen in spite of dissimilar policies.

Is more policy coordination needed for Mexico ? The question arises in view of the increasing role of developments in the U.S. and Canada for Mexico's macroeconomic performance. By "policy coordination" here we mean the formal adoption of a set of common policies, or policy rules, to be followed by all the countries involved -- such as a common currency, fiscal redistribution agreements, and/or contingent fiscal rules like those established in the European Union's Stability Pact. Looser or informal coordination -- which countries would obey in their own interest -- is of course possible, but its desirability is not directly related to the degree of macroeconomic synchronization.<sup>35</sup> More importantly, loose coordination without binding agreements to which the authorities can be held accountable is unlikely to be credible or effective (Eichengreen 2002).

The case for coordination is predicated on two types of arguments, mutually related but conceptually distinct. The first type is economic: when cyclical fluctuations are transmitted across economies, uncoordinated policies may result in insufficient or excessive stabilization. In such conditions, coordinated stabilization policies can deliver higher welfare.<sup>36</sup> Furthermore, coordination with an anchor country enjoying strong reputation may enhance the credibility of domestic policies.

An extreme form of coordination which has attracted considerable attention is monetary unification between the countries involved, be it in the form of a currency union as in EMU, or through unilateral adoption by one country of the other country's currency, with the U.S. dollar as the obvious candidate in the case of NAFTA. Of course, unification is only one possible form of monetary coordination. Other alternatives, such as exchange rate zones, harmonized inflation or money targets, are also possible, but they are subject to the enforcement problems already mentioned. The gains from monetary

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<sup>34</sup> These include the fiscal balance, the primary balance and government current expenditures as percentage of GDP, nominal growth rate of base money, nominal short-term rates, real money balances (M2) and real interest rates.

<sup>35</sup> An example of looser coordination would be implicit or explicit agreements between economic authorities about their separate responses to specific shocks, with the respective responses defined only by domestic considerations and hence dictated only by self-interest. Even in the absence of any agreement policymakers could simply take into account the effects of their actions on other countries – e.g., the U.S. could relax monetary policy not because of a deceleration of growth in its own economy, but because of a strong negative idiosyncratic shock to Mexico.

<sup>36</sup> See Andersen and Spange (2002).

unification stem from the reduction in transaction costs involved in goods and assets trade with the anchor country (and other countries using the same currency) and from its potential role as an expeditious shortcut through which countries with poor policy credibility can acquire the higher credibility of the anchor country.

Against these benefits, the loss of monetary independence also involves costs. Their magnitude is determined by two main factors highlighted in the Optimal Currency Area (OCA) literature. The first one is the degree of similarity between the business cycles of the anchor and client countries. The second is the extent to which in the absence of independent monetary policy the client country can adjust to asymmetric shocks through alternative mechanisms – such as wage and price flexibility, international labor mobility and/or redistributive fiscal policy agreements with the anchor.

Importantly, what matters is the degree of business cycle asymmetry, and the functioning of the alternative mechanisms mentioned, *after* unification, which may differ from that prevailing prior to it. For example, monetary unification itself raises macroeconomic synchronization by encouraging trade. Also, if asymmetry is largely a result of divergent policies, unification will obviously reduce asymmetry. In other words, OCA criteria are partly endogenous – although the precise extent of this endogeneity remains controversial.<sup>37</sup>

In addition, unilateral monetary unification also entails other costs, such as the loss of seigniorage revenues and lender-of-last-resort functions, and the lack of voice of the client countries in the choice of monetary policy by the anchor. These additional costs make it a clearly inferior strategy vis-à-vis a symmetric currency union.<sup>38</sup>

So far we have focused on the economic argument for policy coordination. The second argument for policy coordination is political: tighter coordination of policies helps further the cause of integration. The adoption of common policies makes sense as part of a long-run process of deepening integration, such as that followed by the EU. Policy convergence among its members (as imposed by the Maastricht treaty) was a logical step on the way to a monetary union, itself another step in the European process of political and institutional integration, which was primarily driven by non-economic factors. In contrast, from a political perspective the need for common policies is much less clear if the process of integration is not expected to advance much beyond an FTA.

### *2.6.1 Policy coordination in Mexico*

How do these considerations apply to Mexico? In principle, the increased macroeconomic synchronization with NAFTA partners could make a common policy more likely to fit Mexico. But in practice the absence of institutional mechanisms for joint design and enforcement of policies, and the sheer disparities in economic size

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<sup>37</sup> Frankel and Rose (1998) find a positive impact of currency unions on trade among members, but its magnitude appears implausibly large. See Artis (2002) for a discussion of endogeneity of OCA criteria..

<sup>38</sup> Buiter (1999).

among partners offer little room for true coordination, short of Mexico adopting the monetary and/or fiscal policies of the U.S.

Would Mexico benefit from adopting the monetary policy of the U.S. ? Though developments in the U.S. account for an increasing fraction of the variability of Mexican macroeconomic variables, the scope for asymmetric shocks, and their role in Mexico's GDP growth variation, are still considerable. Nominal price and wage flexibility are lacking in Mexico, and NAFTA does not provide unrestricted labor mobility nor mechanisms of fiscal redistribution to facilitate Mexico's adjustment to shocks in the absence of independent stabilization policy.<sup>39</sup> These facts indicate that Mexico does not meet conventional criteria for an OCA with the U.S. or the U.S. and Canada, and point towards the need for independent policies.<sup>40</sup>

A second problem is the high sensitivity of Mexican variables to their U.S. counterparts in recent years, which often makes the magnitude of the response larger than that of the shock. As shown above, the Mexican economy appears to react more than one-to-one to developments in the U.S. This means that, even in response to common shocks, common policies would not be able to deal properly with Mexico's output and employment fluctuations. Instead, common shocks would demand policies of the same sign, but different intensity, than those of the partner countries.<sup>41</sup>

There are good reasons to expect the impact of policies to differ across NAFTA economies. Regarding monetary policy, Mexico's lower level of financial development and domestic credit to the private sector implies that the interest rate and credit channels are likely to be weaker than in the U.S. and Canada. In turn, since foreign trade as a ratio to GDP is much higher in Canada and Mexico than the US, the exchange rate channel is likely to be more important for the first two countries. Finally, even though we do not have direct evidence on the channels through which fiscal policy works in the three countries, the fact that liquidity constraints are more likely to bind in Mexico than in the other NAFTA countries suggests that the effect of counter-cyclical fiscal policies could be much stronger in the former than in the latter economies, as Ricardian offsetting of public deficits by private surpluses is less likely to occur in the Mexican case.

Hence, there is still a case for macroeconomic policy independence in Mexico vis-à-vis the U.S. However, a different issue is whether Mexico can effectively carry out independent counter-cyclical policies. Regarding monetary policy, it has been argued that emerging market floating exchange rate regimes such as Mexico's do not really grant

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<sup>39</sup> This is particularly the case for Mexico's Southern states, which as shown above have not witnessed any increase in macro synchronization with the rest of NAFTA.

<sup>40</sup> Oil price and international financial shocks (such as the East Asia and Russia crises) are examples of disturbances having a clearly asymmetric effect on Mexico and the U.S., and thus pointing towards the need for stabilization policies of different sign in the two countries. The scope for asymmetric shocks has also been offered as an argument against a monetary union between Canada and the U.S (Murray 1999). In the case of Mexico, formal empirical tests show that Mexico and the U.S. (or Mexico and its two NAFTA partners) do not constitute an optimal currency area, mainly because their cyclical co-movement is not sufficiently high. See Del Negro and Ponce (1999) and Alesina et al (2002).

<sup>41</sup> Alesina and Barro (2002) also underscore this point in the context of currency unions.

monetary independence, and local interest rates end up tracking closely international rates (up to a risk premium) due to ‘fear of floating’ on the part of the authorities in the face of lack of credibility and/or significant currency mismatches in the balance sheets of bank and nonbank private agents (Calvo and Reinhart 2002). In this view, there would be little loss of policy autonomy from monetary unification.

However, recent empirical studies draw a distinction between short- and long-term monetary independence. The evidence confirms that in the long run virtually all countries’ domestic interest rates, regardless of exchange rate regime, move one-for-one with the interest rates of major currencies. In the short term, however, floating exchange rate regimes do allow a degree of monetary autonomy significantly greater than that of pegged regimes.<sup>42</sup> In this regard, the adoption of a flexible exchange rate anchored by inflation targets has increased Mexico’s ability to carry out an independent monetary policy, as has clearly been the case during the current disinflationary episode. Such ability will presumably grow further over time as the credibility of the inflation targeting regime is strengthened and a track record of monetary stability and low inflation is established.

In turn, the scope for counter cyclical fiscal policies is also limited by weak credibility. Mexico’s past tradition of large fiscal deficits and balance of payments crises has led financial markets to regard with suspicion the use of fiscal stabilizers in recessions, because they could signal permanent deficit increases and a deterioration of the public sector’s solvency, rather than just a temporary counter-cyclical adjustment.

Credibility will be reinforced over time by the maintenance of prudent fiscal policies. But it could also be aided by the explicit adoption of (and adherence to) contingent fiscal targets formulated in cyclically-adjusted terms, along the lines of Chile’s recent ‘structural surplus’ rule. These would entail the achievement of fiscal surpluses in periods of expansion to provide room for deficits in times of recession. The creation of suitable fiscal institutions allowing policy makers to implement these rules and abide by them could be a major step forward.

The room for fiscal maneuver is further constrained by the large weight of oil-related income in Mexico’s total fiscal revenues – and, correspondingly, the small size of non-oil tax collection – which makes government income highly sensitive to volatile oil prices and weakens its automatic stabilizer properties. Hence, strengthening Mexico’s ability to carry out counter-cyclical fiscal policy also requires a fiscal reform that reduces the vulnerability of fiscal revenues to fluctuations in the price of oil.

In summary, the evidence of higher macroeconomic synchronization suggests that Mexico’s optimal macroeconomic policies are likely to be more similar now than in the past to those followed by its NAFTA partners. At present, however, Mexico is still subject to significant idiosyncratic shocks, and thus needs to be able to conduct

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<sup>42</sup> See Frankel, Schmukler and Servén (2003), who estimate that the mean lag of local interest rate adjustment to foreign rates lies in the 4-8 month range for floating regimes, and barely above two weeks in hard pegs.

independent monetary and fiscal policies to reduce macroeconomic volatility. The immediate challenge is to strengthen monetary and fiscal institutions in order to build up credibility and enhance the ability of the authorities to pursue counter-cyclical policies.

This does not mean that Mexico would not benefit from some specific forms of policy coordination. For example, harmonization of inflation targets with NAFTA partners could help reduce real exchange rate uncertainty within the FTA and enhance monetary credibility.<sup>43</sup> Likewise, formal sanction by NAFTA partners of the contingent fiscal rules mentioned earlier might also facilitate the buildup of fiscal policy credibility.

### 2.6.2 Policy coordination for other LAC countries

What about policy coordination in the case of other Latin American countries ? On the whole, there seems to be little ground for coordination among LAC countries alone. With few exceptions – such as Nicaragua and Paraguay -- their degree of trade integration is low (Table 6), and their macroeconomic fluctuations are dominated by idiosyncratic shocks.<sup>44</sup> Moreover, there is no obvious anchor country in the region whose policy credibility could enhance that of client countries.

As for coordination with the U.S., Table 6 reveals a contrast between Central American countries, on the one hand, and South America on the other. In general, the former are much more open than the latter, and trade intensity with the U.S. is also considerably higher among Central American and Caribbean countries than South American ones. Indeed, in the former group the combined GDP share of trade with the U.S. and intra-group trade is in most cases around 50 percent, and even exceeds 100 percent in Honduras and Nicaragua. Moreover, Central American economies also exhibit a high degree of *de facto* financial dollarization, which hampers the conduct of independent monetary policy. They also suffer from weak policy credibility.<sup>45</sup> Taken together, all these ingredients seem to make them potential candidates for monetary unification with the U.S. Indeed, El Salvador has already taken this step, although more time is needed to assess its experience with dollarization.

In contrast, lower trade integration with the U.S. and a potentially large scope for asymmetric shocks vis-à-vis the U.S. (partly on account of the key role of commodities such as oil or copper) make most South American countries much less suitable candidates for monetary unification with the U.S. Indeed, some of them (e.g., Mercosur) trade more with the EU than the U.S. Although the scope for asymmetric shocks may decline over

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<sup>43</sup> See Eichengreen (2002).

<sup>44</sup> Loayza, Lopez and Ubide (2001) report a detailed analysis of co-movement using an error components model comparing the results from three blocks of countries: Latin America, East Asia and Europe. They find that common shocks explain a substantial part of the variation in growth rates in East Asia and Europe, but idiosyncratic shocks are clearly dominant for Latin America. Karras (2000) uses a similar methodology when considering if the Americas are an optimal currency area and finds similar results. Hall, Monge and Robles (1999) find a similar preponderance of idiosyncratic shocks in an analysis for Central American countries and Mexico.

<sup>45</sup> See Perry, Lederman and Suescun (2002) and Berg, Boresznstein and Mauro (2002) for further discussion.

time with deeper integration, for these countries the cost of the loss of policy autonomy from monetary unification with the U.S outweigh any potential benefits in terms of increased credibility.

**Table 6. Trade interdependence in Latin America**

	<b>Imports plus exports (percent of GDP) with:</b>				
	<b>Rest of Trading Group*</b>	<b>NAFTA</b>		<b>European Union</b>	<b>World</b>
		<b>United States</b>	<b>Total</b>		
<b>Andean Community</b>					
Bolivia	6.85	5.91	6.42	3.77	38.43
Colombia	4.98	11.72	12.30	4.69	30.09
Ecuador	9.67	20.40	21.40	9.07	61.66
Peru	2.61	7.66	8.13	6.37	27.26
Venezuela	2.43	14.89	15.64	3.70	33.13
<b>Central America</b>					
Costa Rica	7.06	34.39	38.86	15.82	82.69
El Salvador	10.22	11.12	13.84	2.98	36.38
Guatemala	7.06	22.11	26.39	4.01	51.24
Honduras	9.83	88.23	93.04	7.68	139.89
Nicaragua	26.92	27.21	34.74	8.02	96.59
Panama	3.10	13.54	15.16	4.07	37.10
Dominican Republic	1.82	48.42	50.89	5.80	70.70
Jamaica	1.07	25.68	30.54	11.49	60.89
<b>Mercosur</b>					
Argentina	4.97	2.49	2.99	3.44	17.46
Brazil	2.80	5.72	6.55	6.21	23.75
Paraguay	29.32	6.77	7.09	6.53	55.42
Uruguay	13.20	3.66	5.32	6.07	33.67
<b>NAFTA</b>					
Canada	58.85	57.34	58.85	5.77	75.36
Mexico	44.22	42.96	44.22	3.74	55.63
United States	6.08		6.08	3.79	18.79
<b>Memorandum item:</b>					
Chile	9.75	9.91	13.12	11.95	57.26

Sources: Direction of Trade Statistics.

\* In the case of Chile, trade with MERCOSUR.

Instead, most of these economies are likely to benefit from independent monetary policy, and several of them (Brazil, Chile, Colombia, Peru) have already made progress with the implementation of flexible exchange rate regimes guided by inflation targets. Like for Mexico, for them the challenge is to establish a track record of monetary stability and low inflation to strengthen the credibility of the inflation targeting regime.

On the fiscal front, most LAC countries face, to varying degrees, the same problems as Mexico. Poor credibility and inadequate tax collection (which in some cases is dominated by volatile resource revenues) limit their ability to conduct countercyclical policy. In a context of deficient fiscal institutions, the result has often been a procyclical fiscal stance, which augments aggregate volatility instead of reducing it. Achievement of a solid fiscal position will require in many countries a tax reform to expand the revenue base, and also to offset the income loss from declining tariff collection derived from the FTAA, which will be significant for countries trading intensely with the U.S. Like with Mexico, a substantial strengthening of fiscal institutions will also be needed to create room for countercyclical policy.

## **2.7 Concluding remarks**

This chapter has shown that despite the important differences between Mexico and its NAFTA partners, the period after the free trade agreement has been characterized higher business cycle synchronization, the same result that has been observed in the case of trade agreements among industrialized countries. This has potentially important implications for future trade agreements between North and South countries, as it indicates that even in with the significant differences in factor endowments that characterize Mexico and its NAFTA partners higher synchronization is likely to follow from closer trade.

Mexico already had important linkages with the U.S. before NAFTA, as can be inferred from the fact that some sectors of manufacturing and a few Mexican regions exhibited a high sensitivity to developments in the U.S. even then. NAFTA seems to have reinforced the relationship extending the link to other economic sectors and regions by way of a stronger trade bond through which shocks are also transmitted. Thus, even non-tradable pro-cyclical sectors have developed a stronger relationship with developments in the U.S.

Macroeconomic volatility is a potential obstacle for Mexico to reap the full benefits of trade integration, and the increased synchronization between Mexico and the U.S. raises new questions on the appropriate design of macroeconomic policies to deal with volatility, specifically whether Mexico would benefit from sharing a common monetary and/or fiscal policy with its partners.

However, while the higher degree of synchronization implies that the optimal counter-cyclical policies of Mexico and its NAFTA partners will likely be qualitatively more similar in the future, there still remains a large amount of idiosyncratic volatility in Mexico. Furthermore, in spite of the decline in Mexico's macroeconomic volatility in

recent years, volatility still remains higher than in NAFTA partner countries. Finally, the effectiveness of policies is also likely to differ between Mexico and its partners. Thus, while in the very long run deepening integration might open the door to extreme forms of coordination – such as monetary unification -- over the near future management of macroeconomic volatility in Mexico will continue to require different fiscal and monetary policy stances than those followed in Canada and the U.S. The immediate challenge ahead is to strengthen monetary and fiscal institutions to enlarge the scope for counter cyclical macroeconomic policy. Adoption of a set of contingent rules for fiscal policy could be a major step in this direction. Their sanction by NAFTA partners, as well as agreement with them on medium-run inflation targets, could help speed up the buildup of policy credibility.

For other countries intending to join the upcoming FTAA the key concern is to reduce macroeconomic volatility. As noted earlier, unstable economies may see the benefits from trade integration severely curtailed. However, the fiscal and monetary regimes most adequate to achieve this end may differ considerable from one country to another. Most Central American economies are much closer than Mexico to meeting the conditions for an OCA with the U.S.<sup>46</sup> In contrast, for the majority of countries in South America this is clearly not the case. Progress in the development of fiscal and monetary institutions allowing countercyclical policy also varies greatly across countries. Thus, while there is a common objective of reducing volatility, the means to achieve it will depend considerably on the economic and institutional characteristics of each country.

One final point worth stressing, which applies to Mexico as well as to other Latin American economies, is that there is no conflict between the long-term strategies that lead to strong national currencies and to a monetary union. To a large extent, the preconditions are similar: a solid fiscal position, flexible labor markets, and strong prudential regulation and supervision of the financial system. Thus, irrespective of the final decision regarding the degree of policy coordination and monetary unification, the policy agenda is very much the same.<sup>47</sup>

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<sup>46</sup> This is documented by Alesina et al (2002).

<sup>47</sup> Hochreiter, Schmidt-Hebbel and Winckler (2002) underscore this point.

### Box 1: Macroeconomic synchronization in the European Union

Like Mexico, Ireland, Spain and Portugal were relatively small open economies that joined a larger and richer area, the EEC/EU. It is important to keep in mind that integration has been gradually increasing in the EU and has reached a much higher level than in the case of NAFTA, since it has involved not only free trade but also labor migration agreements and a common monetary policy (as well as fiscal policy rules) for EMU members. Furthermore, the difference in levels of development between these three countries and the rest of the EU was smaller than that between Mexico and its NAFTA partners.

A number of studies have examined the evolution of macroeconomic synchronization between these three countries and the rest of the FTA. Artis and Zhang (1995, 1997) assess the effect on synchronization of monetary and exchange rate policy, particularly the establishment of the EMS and the Exchange Rate Mechanism (ERM) in 1979. They find a very sharp increase in the correlation of Portuguese and Spanish business cycles with those of Germany, while no increase is observed with respect to U.S. fluctuations. However, much of this increase is likely due to these countries' entry into the European Union in 1986, rather than to policy convergence.

Several other studies have followed the research by Artis and Zhang using longer time periods and different methodologies. Angeloni and Dedola (1999), for example, look at the correlation between GDP and industrial production of Ireland, Spain and Portugal and that of the EU, breaking the sample into four different sub-periods (pre-ERM, soft ERM, hard ERM, and pre-EMU; the total time period covered is 1965-1997). They find that for both variables the correlation was higher for Portugal and Spain since the hard ERM period. In contrast, there seems to be no such increase in correlation for Ireland. They also find that the increase in output correlation was more gradual than that of industrial production, suggesting that the rising correlation reflects in part cycles in tradable goods and not only common policies.

In another study, Belo (2000) calculates industrial production correlations and cyclical coherence for several countries and the Euro zone in the period 1960-1999, splitting the sample in 1979 coinciding with the ERM. The results are similar to those found in the other studies, though in the case of Ireland the initial association is weaker, and therefore it is found to have risen over time. Nonetheless, such increase is still the smallest across countries in the sample.<sup>48</sup>

Boone (1997) uses a vector auto regression analysis to identify demand and supply shocks for the countries in the European Union (and some other countries as controls), using a methodology similar to that used by Bayoumi and Eichengreen (1996). He analyzes the degree of correlation between demand and supply shocks of each country with Germany. In the case of supply shocks, he finds that their correlation is fairly constant for Ireland and Spain in the period 1974-1990, but it increases in the 1991-1994 period. In the case of Portugal, the correlation of supply shocks is already quite high in the period 1980-1990 but becomes higher as well in 1991-1994. As for demand shocks, the correlation in the three countries either remains constant or diminishes in the period 1991-1994. Like with previous studies, this evidence seems more consistent with gradually increasing trade integration than with common policies. Indeed, the increase in correlation of supply shocks is precisely what could be expected from greater trade integration.

Finally, a recent study by Ramos *et al* (2003) examines the role of aggregate and sector-specific shocks in the observed performance of manufacturing industries across European countries. They find that aggregate shocks have become a less important source of variability in recent years, especially in the EU's peripheral countries as well as among EMU members. They view this finding as reflective of the increased coordination of macroeconomic policies, although they do not examine the role that increased trade integration may have played to achieve this result.

Thus, with some exceptions, most of the empirical studies on business cycle synchronization in Ireland, Portugal and Spain with the rest of the European Union suggest that the main force behind the increasing synchronization was deeper trade integration rather than common policies such as the ERM. The evidence also suggests that synchronization increases first in the tradable goods sector, and only later in the rest of the economy.

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<sup>48</sup> Borodo, González and Rodríguez (1998) find similar results looking at five year moving correlations.

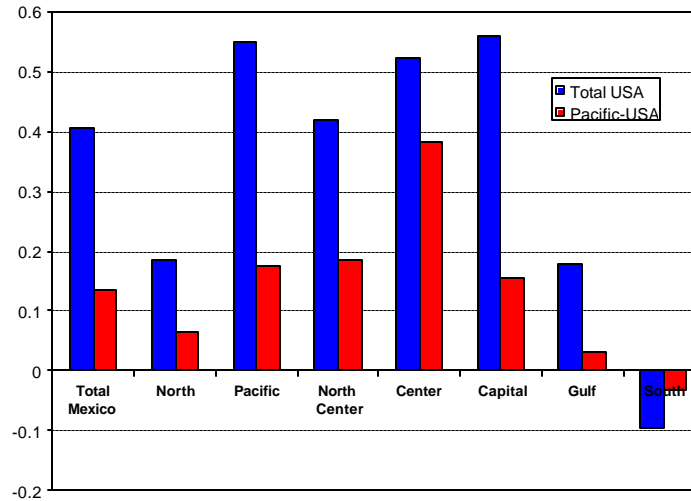
## Box 2: Macroeconomic synchronization at the regional level

Has NAFTA had different effects across Mexico's regions on the degree of macroeconomic synchronization with the U.S.? In principle, we would expect to see higher synchronization with the U.S. in the northern states of Mexico, given their lower transport costs to access the U.S. market, and in those regions producing tradable goods. But the northern regions were already relatively integrated with the U.S., and for them the marginal change may be modest. In that case, we could find a larger increase for other regions that were less integrated but produce tradable goods. To explore this question, we used monthly employment data by region.<sup>49</sup> Box Table 1 shows the correlation of employment growth between Mexican regions and the U.S. (both at the national level and for the Pacific region) over 1992-2001 and 1997-2001. Over the longer period, the North and the Gulf regions of Mexico exhibited the largest correlation (0.37 and 0.28, respectively) with U.S. employment growth. However, most of Mexico's regions were highly synchronized in terms of employment growth with the U.S. Pacific region. The correlation coefficients are between 0.53 and 0.82. The last two columns in the table show that for 1997-2001 the correlation coefficients rose for all Mexican regions, with the exception of the South.<sup>50</sup> The change in the correlation coefficients across periods is depicted in Box Figure 1.

Box Table 1  
Correlation coefficients between annual employment growth rates in Mexico and the U.S., by region

	1992-2001		1997-2001	
	Total USA	Pacific-USA	Total USA	Pacific-USA
Total Mexico	0.22	0.80	0.63	0.93
North	0.37	0.82	0.55	0.88
Pacific	0.14	0.69	0.69	0.86
North Center	0.21	0.70	0.63	0.89
Center	0.07	0.53	0.59	0.91
Capital	0.12	0.70	0.68	0.86
Gulf	0.28	0.76	0.46	0.79
South	0.12	0.55	0.02	0.52

Box Figure 1.  
Change in the correlation of employment growth between Mexican and U.S. regions



Regression estimates, as well as factor analysis, of regional employment growth confirm that most Mexican regions have become more sensitive to U.S. developments in the post-NAFTA period. The exception is again the South region. Thus, in addition to the well-documented income gap, another gap appears to have opened between the South and the rest of Mexico in terms of macroeconomic synchronization with the U.S.

<sup>49</sup> The required production data are not available. The employment data come from the Mexican Social Security Institute (IMSS) and the U.S. BLS.

<sup>50</sup> This latter result is not surprising, since this region also has the lowest correlation with any other Mexican region.

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