Synchronization of Economic Activity between Mexico and the US: How did it happen?

Ramon A. Castillo Ponce*

California State University, Los Angeles
Department of Economics and Statistics
And
Universidad Autónoma de Baja California
Facultad de Economía y Relaciones Internacionales
5151 State University Drive
Los Angeles, CA, USA 90032

Rogelio Varela Llamas

Universidad Autonoma de Baja California
Facultad de Economía y Relaciones Internacionales
Calzada Universidad No. 14418
Mesa de Otay, Tijuana
Baja California, Mexico 22390

Juan Manuel Ocegueda Hernández

Universidad Autonoma de Baja California
Facultad de Economía y Relaciones Internacionales
Calzada Universidad No. 14418
Mesa de Otay, Tijuana
Baja California, Mexico 22390

*rcastil@calstatela.edu

We thank comments and conversations from/with Daniel Garces, Jorge Herrera, Pablo Mejia, participants at the XVIII Mexican Colloquium of Mathematical Economics and Econometrics, and participants at the University Conference Series at Universidad Francisco Gavidia, El Salvador. The first author would like to especially thank Adalberto Campos and Elner Crespin for their hospitality during the summer 2008.

Synchronization of Economic Activity between Mexico and the US: How did it happen?

Abstract

In this document we determine the importance of the manufacturing sector as an engine of synchronization and propose two possibilities for explaining this phenomenon. Using data on manufacturing production for the entire industry and 8 of its 9 divisions, we find little evidence of synchronization between manufacturing output in Mexico and the US. In particular, while we identify the existence of cointegration relationships in all cases, common features tests results show that, for the most part, neither total production nor individual sectors production in Mexico share common cycles with manufacturing production in the US. Hence, it is unlikely that the synchronization of the business cycles between these two countries emerged as the result of the synchronization of economic activity in the manufacturing sector, as previous studies have suggested. Given these results, we propose two alternatives for explaining synchronization of the business cycles in Mexico and the US: the dynamics of the gross domestic product of the service sector and aggregate consumption. We obtain some promising results and recommend further research along this venue.

JEL classification codes: C32, E32, F4.

Keywords: integration, common trends, common cycles, manufacturing, consumption, service sector

Introduction

Standard economic theory suggests that, as countries intensify the trade of goods and services, business cycles tend to synchronize. This has been the premise for various studies analyzing economic integration in North America. Some have considered the three economies, Canada, Mexico and the United States (US), including Cuevas et al. (2003), Rosmy and Simons (2007) and Castillo and Ramirez (2008). The first examines how sensible the Mexican economy has become to movements in the northern most economies after 1994. The second explores the dynamics of gross domestic products and finds a common cycle but not common trends. In contrast, the third identifies both for the period 1980 to 2006. Primarily, however, research has focused on the relationship between Mexico and the US, especially since the signing of the North American Free Trade Agreement (NAFTA). For example, Torres and Vela (2003) examine the importance of the manufacturing sector as an engine of integration. Similarly, Chiquiar and Ramos-Francia (2005) analyze the contribution of production-side links to the synchronization of economic activity. More recently Mejia et al. (2006) evaluate the degree of association between the business cycle in the US and production in the Mexican manufacturing sector.

Overall, the understanding about the economic integration of Mexico and the US centers on the claim that the signing of NAFTA accentuated the interrelation across the manufacturing industries and, as a result, the business cycles of the two countries became synchronized. While the argument seems to be reasonable, we find evidence that manufacturing activity in Mexico is, in some cases, more closely associated with the overall economic activity in the US than with its US counterpart. That is, production in various divisions of Mexico's manufacturing industry appears to respond more

significantly to aggregate output than to production of their mirror divisions in the US. As such, the strengthening of production-side linkages argument of synchronization appears to be rather weak. That is, if the business cycles of Mexico and the US became synchronized because of the increased interdependence of the manufacturing industries, we would reasonable expect to find that the manufacturing sectors in both countries are also synchronized; which is not the case. In particular, it is true that correlations across manufacturing production series increased since the signing of NAFTA, and that a regression on the first differences of the series produces significant statistical associations. However, when implementing a trend-cycle decomposition exercise, we find that manufacturing productions in Mexico and the US do not share a common cycle. Our results are in line with the findings in Fragoso et al. (2008); while the authors find common trends and common cycles between employment series in Mexico and the US for total manufacturing, they identify a similar relation for only two of the nine manufacturing divisions.

Moreover, we notice somewhat unsound arguments in previous analysis that cast doubt on the conclusion that NAFTA triggered the synchronization of cycles across the manufacturing sectors, and hence led to the synchronization of the business cycles. For example, Torres and Vela (2003) considered a sample from 1992 to 2001 and classified the movements of the business cycles in three stages. They point to a gradual and increasing synchronization of the cycles by fundamentally looking at the 2001 economic slow-down and noticing a closer association of economic variables ever since. However, we could as easily show that similar movements in the business cycles existed well before the signing of NAFTA. For instance, in the early 1980´s there appears to be a highly synchronized dynamic in the movements of the growth rates for

the three North American economies. In fact, Rosmy and Simons (2007) identify this period as one of the common recessions in the North American business cycle. We also notice that a good number of studies on the subject based their analysis on estimating simple methodologies, rendering the results somewhat unconvincing.

Clearly, the argument that production-side links between the two countries contributed to the synchronization of the business cycles, as presented in Chiquiar and Ramos-Francia (2005), is plausible, however, the relatively small contributions of the industrial sectors to aggregate output in Mexico and the US make the possibility that synchronization between the two economies was channeled through the manufacturing industry a very unlikely candidate.

In this document we consider two possible alternative explanations for the high degree of economic interdependence between Mexico and the US: the dynamics of the services sectors and the behavior of aggregate consumption. With respect to the first possibility, we recognize that the service sector is the major contributor to aggregate output in both economies, around 60%. Hence, similarities in the movements on this variable across countries may shed light as to the cause, or causes, of business cycles synchronization. The other alternative, consumption patterns, is clearly in line with recent developments in the behavior of financial markets, aggregate consumption and overall economic activity in Mexico and the US. In particular, notice that prior to the 1994 peso crisis the credit market expanded vigorously in Mexico, and so did consumption and GDP.[1] This

[1] We would like to point out that, although consumption credit in Mexico has traditionally represented a small share of GDP, 3.1% in 1994, 2% in 2004 and up to 4% in 2006, its growth rate has at times been very robust. For instance, from 1988 to 1994 credit granted to the private sector grew at historically high rates. Hence, it is not surprising to find that consumption in that period grew faster than GDP.

expansion coincided with the recovery of the US from the 1990-1991 economic slow-down. After a brief period of contraction in the Mexican credit market, the same was reactivated in the late 1990's and expanded, though slowly, until the end of 2008, when the US financial crisis took its toll in the Mexican market. As we all know, a similar expansion occurred in the US in the early-mid 2000's, until the dramatic crash in 2007. Notice then, that from 1988 to 1994 growth in Mexico can be associated with the activation of the credit market. This expansion corresponded with growth in the US after the early 1990's contraction. Subsequently, after the 1995 recession, the Mexican economy recovered and expanded; though a slow-down began in late 2008 and it is expected to continue through at least 2009. In the US economic activity was also robust, until 2007 when the credit market collapsed. Hence, one can argue that the similarities in economic growth between the US and Mexico during the late 1980's, part of the 1990's, and late 2000's were primarily due to the dynamic of consumption patters in both countries (with the exception, of course, of 1995).[2]

It is worth mentioning that throughout the document our argument as to why we identify some similarities between consumption in the US and Mexico is based on the observation that credit markets in both countries have followed comparable patterns during certain periods of time. We see this as a reasonable explanation of the phenomenon. Hence, it would be ideal to conduct a rigorous analysis on the financial and credit markets in both countries. However, we recognize that the task of examining

[2] It is interesting to note that at the beginning of 2008, even though manufacturing in the US and Mexico were slowing down, the sentiment in Mexico was that the US economic contraction would not affect the Mexican economy significantly; primarily because financial markets were perceived to be immune to what was happening in the US, and nobody thought the problem is the US was so severe. Once it became clear that the financial crisis in the US was far worse than first thought, and that financial markets in Mexico would be affected, the political discourse in Mexico changed. Policy makers recognized the magnitude of the problem and accepted that Mexico would also experience a recession. The main sources of which are the crises in financial and credit markets in both countries. Not the slow-down in the manufacturing industry.

statistical relationships across asset markets is a haunting one, and surely deserves one's devoted effort. Given the scope of this document, we center our attention to determine if consumption in the US and Mexico do in fact share common characteristics. Once we evaluate this possibility, we could then proceed to identify the factors that influence the behavior of this economic aggregate in both countries.[3]

One may notice that considering the GDP of the service sector and aggregate consumption does not provide with a direct mechanism of synchronization between two economies, after all, there are no clear channels of trade or exchange with neither of our two candidates. After all, services and consumption are for the most part non-tradable. However, we are, in fact, suggesting that similar movements of the economies of the US and México are the result not only of increasing trade, since trade among the two countries has been intense for decades, but the consequence of additional factors that have become common in the two countries: the orientation of production activities to the service sector and consumption patterns. That is, the synchronization of the business cycles between the US and Mexico is the result of various factors, not only increasing trade; and, as we shall show, not due to the synchronization of economic activity in the manufacturing industry. On this respect, we should mention that the debate about the factors that contribute to economic synchronization continues to this date with no definite consensus. While some claim that the increase in intra-industry trade may serve as an engine of integration, others suggest that factors such as input endowments may be more relevant to achieve synchronization.[4]

[3] Evidently, determining the factors that defined the synchronization between the US and Mexico is not a trivial matter, and surely requires much more attention. As it is indicted in the text, our goal here is to pose two possibilities to understand the phenomenon.

[4] See Imbs (2003) for a detailed discussion or Cuevas et al. (2003) for a nice description of the relevant literature.

Clearly, ours is an argument different to the previous two. We essentially pose that in the case of Mexico and the US, given that they have been trading intensively since at least the 1980s, and that evidently their endowments are different, the synchronization of their business cycles may be the result of a combination of factors not previously considered; including the transformation of Mexico into a more service oriented economy and the development of the credit markets and its consequences on consumption patterns. In other words, economic activities in both countries have become more similar and hence their aggregate production has tended to synchronize. It is worth mentioning that we do not develop this document with the intention to provide definite evidence that the service sector and aggregate consumption are the factors that fully explain synchronization of economic activity between the US and Mexico. Our aim is less ambitious. We limit ourselves to provide suggestive evidence of the possible causes of synchronization. Evidently, more rigorous theoretical and empirical studies would follow this initial effort to evaluate the sources of economic synchronization between these two countries.[5]

We conduct our analysis with the implementation of various econometric estimations and obtain some results that seem to support our contentions. First, we identify a low degree of synchronization, as defined by the existence of common movements in the short-run and long-run, between pairs of manufacturing divisions in Mexico and the US; and between US imports and manufacturing production in Mexico. Second, we show that activity in the Mexican manufacturing industry is closely associated with overall economic activity in the US. Thus, similar movements in the manufacturing sectors may

[5] Ideally, one would develop a theoretical model that shows how the homogenization of the service sectors and consumption patterns in different countries may lead to business cycle synchronization. In our view, however, this is the first attempt to offer a novel argument as to how the economies of the US and Mexico became synchronize; given that we find no evidence that the behavior of the manufacturing sectors is *the* main factor of synchronization.

very well be the result of both of them responding to a common factor (aggregate output) and not the cause of that common factor. In other words, we alert of a potential endogeneity problem when analyzing the manufacturing sectors as the source of business cycles synchronization. Third, we evaluate the degree of interdependence between the GDPs of the service sectors and aggregate consumption in Mexico and the US. Overall, we find evidence suggesting that, while production-side links may have contributed significantly to the synchronization of the business cycles, it is unlikely that increased integration in the manufacturing sectors is *the* factor that explains similar dynamics in the economic cycles of Mexico and the US.

The remaining of the document is organized as follows: Section I presents the analysis for the manufacturing industries. First, we consider the association across production for the entire industry and individual divisions. Then, an evaluation of the relationship between US imports and manufacturing output in Mexico in conducted. For both cases we include statistical and econometric estimations. In Section II we conduct the analysis of our two candidates for explaining the synchronization of the business cycles: GDP in the service sector and aggregate consumption. Section III concludes.

Section I. The manufacturing industry

I.1 Data

We consider data on production for the entire industry and eight of its nine manufacturing divisions. We do not include division nine since the products contained in the Mexican classification do not match those reported for the US. The source was

the National Institute of Statistics, Geography, and Informatics (INEGI). For the US we obtained data on manufacturing production and industrial production from the Bureau of Economic Analysis. Our study required data on imports from the US and the GDPs of Mexico and the US. The source for the first was the Census Bureau and for the second and third Banco de Mexico. The sample for the manufacturing data covers the period from January 1980 to June 2007 at monthly frequency. Since product classification is not homogeneous for the manufacturing divisions across the US and Mexico, we performed a matching exercise for every division included in the analysis. A full description of the same is reported in the appendix.[6] The exercise for the GDPs includes data from the first quarter of 1980 to the fourth quarter of 2007; imports were available from 1987 to 2007. All data are expressed in constant terms.

We first illustrate the now widely known joint behavior of the gross domestic products of Mexico and the US. Graph 1 presents the series in levels and Graph 2 the annual growth rates.[7] As previously noted, if we were to restrict our attention to the just-before and to the just-post NAFTA period, we may erroneously conclude that the signing of the trade agreement led to the synchronization of the growth rates. It is evident that in the early 1980's the series exhibited similar dynamics.[8] In fact, only from 1990 to about 1992 the growth rates follow distinct patterns. This observation is consistent with the findings of Rosmy and Simons (2007), who identified a North American business cycle and three common contractions in the economies of Canada, Mexico and the US: early

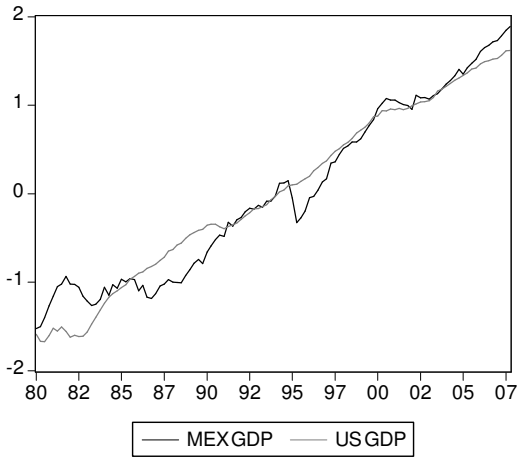
[6] Our matching strategy for the manufacturing divisions is similar to that employed in previous studies, including Fragoso et al. (2008).

[7] Throughout the document, graphical representations use a normalized scale to better illustrate the behavior of the variables. Hence, the numbers on the *y* axis do not correspond to specific units. Also, we consider the logarithmic transformation of the variables.

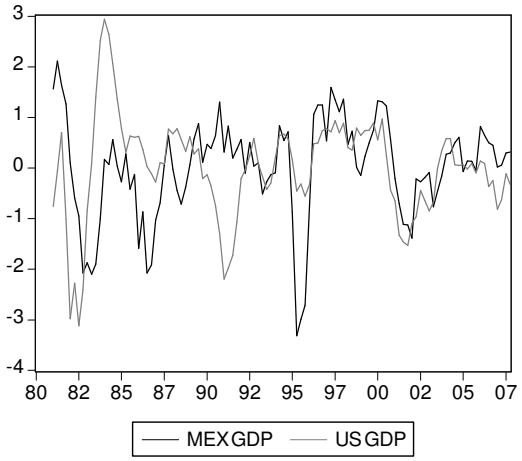
[8] We should emphasize that high correlation of annual growth rates among time series is not associated with synchronization of the cyclical component of the series. As defined in Vahid and Engle (1993), the existence of a common cycle is determined by the existence of serial correlation common feature among the first differences of a set of I(1) variables.

1980's, early 1990's and 2001. These graphs illustrate what is commonly accepted, that the economies of Mexico and the US follow common movements. Now, the task becomes to determine the factors that contributed to such phenomenon.

Graph 1
GDP series in levels



Graph 2
GDP series in growth rates



I.2 Manufacturing in the US and Mexico

We begin with a rudimentary comparison of the behavior for total production and production in each of the eight divisions in the US and Mexico. Table 1 presents simple correlations across the series in levels. With the exception of total manufacturing and division 5, in all cases the correlation between the Mexican divisions and industrial production in the US is greater than with the US divisions. For comparison purposes, we also computed the correlations for the after-NAFTA period, 1996-2007. The numbers are presented in Table 2. Interestingly, the correlations for the between-divisions series are lower in the shorter period, but the correlations with respect to industrial production continue to be relatively strong; with the exception of divisions 2 and 3. That is, the linear association of manufacturing production with respect to overall economic activity remains significant while the same decreased with respect to the US counterparts. This rudimentary computation provides an initial approximation to understand the relationship between the series, as highly correlated series in levels are strong candidates to exhibit a significant long-run association.

Table 1.Simple correlations: series in levels sample 1980-2007.

Mex Division	Total	1	2	3	4	5	6	7	8
US Division									
Total	0.97								
1		0.91							
2			-0.30						
3				0.13					
4					0.74				
5						0.96			
6							0.88		
7								0.62	
8									0.94
US Ind. Prod.	0.97	0.97	0.61	0.18	0.91	0.96	0.95	0.97	0.95

Table 2. Simple correlations: series in levels sample 1996-2007.

Mex Division	Total	1	2	3	4	5	6	7	8
US Division									
Total	0.93								
1		0.61							
2			0.52						
3				-0.02					
4					-0.09				
5						0.72			
6							0.70		
7								0.28	
8									0.88
US Ind. Prod.	0.92	0.88	-0.06	-0.03	0.67	0.78	0.89	0.82	0.90

We proceed to compute simple correlations for the growth rates of the series, we do it for the entire sample and for the 1996-2007 period. The results are presented in Tables 3 and 4, respectively. This exercise is, as indicated in the introduction, similar to what other authors have done to examine synchronization. In general, it is argued that a strong correlation between these "business cycle" series is evidence of synchronization. We now recognize why other authors have concluded that the signing of NAFTA led to the synchronization of economic activity in the manufacturing sector, and in consequence of the economic cycles; just about every division-division correlation increased significantly after 1996. In the case of total manufacturing, the correlation went from 0.31 to 0.77. Interestingly, the correlation between manufacturing production and industrial production also increased, and in both samples the same is grater in all cases than the correlation of manufacturing production in Mexico with manufacturing in the US. That is, even in growth rates there appears to be a more significant association between manufacturing activity and overall economic activity, than across manufacturing industries.

Table 3. Simple correlations: annual growth rates sample 1980-2007.

Mex Division	Total	1	2	3	4	5	6	7	8
US Division									
Total	0.31								
1		0.09							
2			0.14						
3				0.05					
4					0.11				
5						0.09			
6							0.11		
7								0.57	
8									0.42
US Ind. Prod.	0.37	0.01	0.23	0.25	0.23	0.28	0.28	0.61	0.38

Table 4. Simple correlations: annual growth rates 1996-2007.

Mex Division	Total	1	2	3	4	5	6	7	8
US Division									
Total	0.77								
1		0.03							
2			0.50						
3				0.27					
4					0.53				
5						0.35			
6							0.43		
7								0.51	
8									0.67
US Ind. Prod.	0.77	0.33	0.67	0.58	0.69	0.60	0.51	0.55	0.73

If we were to simply consider the previous results, we may be tempted to conclude that there is evidence of synchronization in the manufacturing industry. However, as we indicated in footnote 4, the concept of synchronization, or sharing a common cycle, does not apply to the growth rates of time series, but to the existence of a serial correlation common feature among the first differences of a set of I(1) variables. With this concept in mind, we compute the simple correlations between the first differences of the series as an illustrative exercise. The results for the entire period and for the post-NAFTA period are presented in Tables 5 and 6 respectively. Notice that, in general, the correlations are insignificant. In fact, the highest correlation corresponds to the association across division 8 the US for the post-NAFTA period. Hence, we find little evidence of a high degree of association between the first differences of the series.

Although the previous by no means represents a formal analysis, at least it provides an illustration of what we can expect to find when the adequate methodologies are applied.

In the following section we implement the econometric exercise to formally test the statistical relations between the series.

Table 5. Simple correlations: first difference sample 1980-2007.

Mex Division	Total	1	2	3	4	5	6	7	8
US Division									
Total	0.28								
1		-0.07							
2			0.25						
3				-0.16					
4					-0.07				
5						0.06			
6							0.27		
7								0.05	
8									0.43
US Ind. Prod.	0.21	0.03	0.22	-0.18	0.05	0.06	0.19	0.08	0.35

Table 6. Simple correlations: first difference sample 1996-2007.

Mex Division	Total	1	2	3	4	5	6	7	8
US Division									
Total	0.32								
1		-0.12							
2			0.16						
3				-0.44					
4					-0.05				
5						-0.06			
6							0.28		
7								0.10	
8									0.53
US Ind. Prod.	0.26	0.03	0.21	-0.38	0.20	-0.07	0.33	0.21	0.46

I.2.1 Empirical Exercise

The econometric strategy consists on testing for common trends and common cycles. Since the methodology employed to conduct the cointegration analysis, Johansen (1991), is amply known we spare the reader from a detailed description. We briefly describe, nonetheless, the Vahid and Engle (1993) methodology: consider the Wold representation of the stationary first difference of a $nx1$ vector y_t.

$$\Delta y_t = C(L)e_t = C(1)e_t + (1-L)C^*(L)e_t \qquad (1)$$

Integrating (1) we obtain

$$y_t = C(1)\sum_{i=0}^{\infty} e_{t-i} + C^*(L)e_t \qquad (2)$$

which is the common trend representation derived in Stock and Watson (1988) an in fact a multivariate version of the Beveridge -Nelson trend-cycle decomposition. In (2) the first term represents the trend component and the second the stationary cyclical component. The existence of cointegration implies that $\alpha' C(1) = 0$ and α is a nxr matrix of r cointegrating vectors. Similarly, the existence of common serial correlation features implies that $\tilde{\alpha}' C^*(L) = 0$ and $\tilde{\alpha}$ is a nxs matrix of s common features. The cointegrating relationships can be estimated employing various methodologies. As it was previously mentioned, however, we use that suggested in Johansen (1991) since this methodology allows us to compute the number of cointegrating relations (r).

The number of common features (s) is estimated by first computing the squared canonical correlations (λ_j^2) in the system, and then testing the null hypothesis $\lambda_j^2 = 0, \forall_j = 1, 2, ..., s$. Under the null, the relevant test statistic is $C(p,s) = -(T - p - 1)\sum_{i=1}^{s} \log(1 - \lambda_i^2)$ and has a χ^2 distribution with $s^2 + snp + sr - sn$ degrees of freedom. The number of lags to be included in the system, p, corresponds to one less than the number of lags in the autoregressive system in levels. We would like to comment that this exercise is equivalent to testing for cointegration, but for the short-run. In this case we look for a combination of stationary series that eliminates the serial

correlation between the series and their past history. Hence, the methodology centers on the first differences of the series and not the growth rates, as we indicated previously.

Our first exercise consists on performing unit root tests for each of the series. We choose to implement the test suggested by Kwiatkowski-Phillips-Schmidt-Shin (KPSS). The results are presented in Table 7. With the exception of division 3 for Mexico, the series are integrated of order 1. It is worth mentioning, however, that in the case of divisions 5 and 6 for the US and division 6 for Mexico, it was necessary to conduct further testing to determine the degree of integration. In all cases we concluded that the series are in fact I(1).

Table 7. Unit root tests.

Variable	Test Statistic Level	Test Statistic First Diff.	Critical Value 5%	Order of Integration
Manufacturing Production: US				
Total	0.209	0.135	0.146	I(1)
Division 1	0.414	0.062	0.146	I(1)
Division 2	0.442	0.070	0.146	I(1)
Division 3	0.197	0.045	0.146	I(1)
Division 4	0.530	0.047	0.146	I(1)
Division 5	0.148	0.100	0.146	I(1)*
Division 6	0.115	0.076	0.146	I(1)*
Division 7	0.159	0.073	0.146	I(1)
Division 8	0.325	0.096	0.146	I(1)
Manufacturing Production: Mexico				
Total	0.242	0.139	0.146	I(1)
Division 1	0.282	0.016	0.146	I(1)
Division 2	0.199	0.085	0.146	I(1)
Division 3	0.158	0.025	0.146	I(0)**
Division 4	0.212	0.100	0.146	I(1)
Division 5	0.231	0.033	0.146	I(1)
Division 6	0.121	0.035	0.146	I(1)***
Division 7	0.190	0.049	0.146	I(1)
Division 8	0.191	0.042	0.146	I(1)
US Ind. Prod.	0.154	0.086	0.146	I(1)

* Given that the test statistics are close to the critical value, we conducted further unit root tests to confirm the order of integration. We found evidente that the series are in fact I(1).

**From the graphical analysis, and given the fact that the test statistic is close to the critical value it is unclear tha the series is nonstationary. Hence, we conducted further unit root tests and determined that the series is I(0).

***In this case, we also concluded from various other unit root tests that the series is I(1).

Once the order of integration has been determined, we proceed to estimate the cointegration relations. We construct two different bivarate systems. The first includes manufacturing production in Mexico and its US counterpart, for the total and each of the divisions analyzed. The second pairs individual Mexican manufacturing series with US industrial production. Table 8 presents a summary of results (complete statistics are reported in the appendix for all estimations). In all cases throughout the document we normalize the vectors with respect to the Mexican variable.[9]

Table 8. Cointegration tests 1980-2007.

Mexican Series	US Series	Cointegration	Cointegrating Vector
Total	Total	Yes	1, -0.91 (0.05)
	Ind. Prod.	Yes	1, -1.04 (0.06)
Division 1	Division 1	Yes	1, -2.25 (0.08)
	Ind. Prod.	Yes	1, -0.96 (0.05)
Division 2	Division 2	Yes	1, 0.04 (0.13)
	Ind. Prod.	Yes	1, -0.34 (0.08)
Division 4	Division 4	Yes	1, -0.13 (0.15)
	Ind. Prod.	Yes	1, -0.76 (0.05)
Division 5	Division 5	Yes	1, -0.99 (0.04)
	Ind. Prod.	Yes	1, -0.83 (0.03)
Division 6	Division 6	Yes	1, -1.59 (0.18)
	Ind. Prod.	Yes	1, -0.86 (0.06)
Division 7	Division 7	Yes	1, -3.46 (0.55)
	Ind. Prod.	Yes	1, -1.19 (0.06)
Division 8	Division 8	Yes	1, -1.45 (0.11)
	Ind. Prod.	Yes	1, -1.67 (0.12)

Standard error in parenthesis

[9] Just to clarify, since we report normalized vectors, the qualitative association between the variables is the opposite of the sign shown on the tables. Also, for all econometric estimation throughout the document, we consider various specifications, i.e. adding a constant, a trend or both.

First, we notice that there is evidence of cointegration for every system. With the exception of Mexico-US division 2, the qualitative relation is positive, which is what one could reasonably expect to find. It is interesting to recognize that in three of the seven divisions (2, 4, and 8) the magnitude of the coefficients for the Mexican divisions with respect to industrial production is greater than the corresponding to its US counterpart. This is also the case for total manufacturing. That is, in these cases there appears to be a closer association between manufacturing production in Mexico and economic activity in the US, than with the manufacturing sector in the US. This result is somewhat surprising, since for the most part previous studies have argued that increasing integration across manufacturing divisions in both countries has led to the integration of the two economies. From our results, this argument does not seem to hold. If that were the case, we would expect to find a stronger association *vis a vis* manufacturing production relative to the association with respect to US industrial production.

To further evaluate the degree of integration between the manufacturing sector in Mexico and economic activity in the US, we conduct the common cycle test previously described. As it was the case for the cointegration tests, here we consider two types of systems, one that contains the Mexican and US divisions, and one that includes the Mexican divisions and US industrial production. A summary of results is presented in Table 9.[10] We find no evidence of common cycles, with the exception of the Mexican division 5 and the corresponding US division. At first sight, these results may be surprising, but once we recognize that the common cycle test is performed on the first differences of the series, the results appear to be consist with what the simple

[10] We thank Professor Joao Issler for generously providing the GAUSS code to run the tests.

correlations suggested. As shown in Tables 5 and 6, there exists a very small linear association between the differentiated series.

Table 9. Common cycle tests 1980-2007.

Mexican Series	US Series	Common Cycle	Cofeature Vector
Total	Total	No	1, -0.04 (0.04)
	Ind. Prod.	No	1, -0.06 (0.03)
Division 1	Division 1	No	1, -0.16 (0.05)
	Ind. Prod.	No	1, -0.06 (0.03)
Division 2	Division 2	No	1, -0.03 (0.04)
	Ind. Prod.	No	1, 0.03 (0.02)
Division 4	Division 4	No	1, 0.08 (0.04)
	Ind. Prod.	No	1, -0.30 (0.27)
Division 5	Division 5	Yes	1, 0.05 (0.03)
	Ind. Prod.	No	1, 0.06 (0.03)
Division 6	Division 6	No	1, -0.28 (0.06)
	Ind. Prod.	No	1, -0.13 (0.03)
Division 7	Division 7	No	1, 0.03 (0.06)
	Ind. Prod.	No	1, 0.04 (0.03)
Division 8	Division 8	No	1, -0.13 (0.06)
	Ind. Prod.	No	1, -0.10 (0.03)

Standard error in parenthesis

One may argue that for the 1980-2007 the case for a common cycle is weak, since the economies were not that integrated. Thus, a test for a post-NAFTA period may render different insights. We performed the common cycles test for the sample 1996-2007, the results are presented in Table 10. Again, with the exception of division 5 we find no

evidence of the existence of common cycles. Wee should mention, nonetheless, that according to the standard errors reported in tables 9 and 10, the regression coefficients for some division-division systems are significant. This is the case for divisions 1, 4, 6, and 8 for the sample period 1980-2007 and divisions 1, 6, and 8 for the post-NAFTA sample. Hence, as we indicated before, the issue is not that there are no significant associations between production in the Mexican and US manufacturing sectors, but that the variables do not share a common cycle as defined in this paper.

Table 10. Common cycle tests 1996-2007.

Mexican Series	US Series	Common Cycle	Cofeature Vector
Total	Total	No	1, -0.05 (0.08)
	Ind. Prod.	No	1, -0.08 (0.06)
Division 1	Division 1	No	1, -0.14 (0.08)
	Ind. Prod.	No	1, -0.12 (0.05)
Division 2	Division 2	No	1, 0.04 (0.08)
	Ind. Prod.	No	1, 0.13 (0.06)
Division 4	Division 4	No	1, 0.04 (0.03)
	Ind. Prod.	No	1, -0.06 (0.04)
Division 5	Division 5	Yes	1, 0.04 (0.03)
	Ind. Prod.	No	1, 0.14 (0.04)
Division 6	Division 6	No	1, -0.19 (0.07)
	Ind. Prod.	No	1, -0.20 (0.06)
Division 7	Division 7	No	1, 0.07 (0.10)
	Ind. Prod.	No	1, -0.13 (0.07)
Division 8	Division 8	No	1, -0.27 (0.08)
	Ind. Prod.	No	1, -0.14 (0.04)

Standard error in parenthesis

From the previous results we gather that the manufacturing sector contributed very little to the synchronization of the business cycles of Mexico and the US. It seems to us that the similar patters in the behavior of industrial production and the manufacturing series are the result of a response to one or various factors, not a causal relation running from the manufacturing industries to aggregate output.

I.3 Manufacturing in Mexico and US Imports

Clearly, analyzing the association between divisions across countries may not be fully satisfactory, since there is no reason to believe that economic activity among comparable divisions is related across the border; although Chiquiar and Ramos Francia (2005) indicate that after the signing of NAFTA the interdependence of manufacturing divisions in Mexico and the US tended to intensify. To address this concern, we perform another set of estimations but now considering imports form the US and manufacturing production in Mexico.

Our first exercise consists on estimating simple correlations for the levels, growth rates and first differences of the series. The results are presented in Table 11. We recognize something quite interesting, the correlations for the series in levels for the sample period 1987-2007 are higher that the correlations for the period 1996-2007. The correlations for the growth rates, however, are in general greater for the more recent period, once again, a feature that has been interpreted as evidence of synchronization between Mexico and the US. For the first differences we get mixed results, in some cases the correlations are greater for the post-NAFTA period and in other cases smaller; though the differences between the numbers are for the most part insignificant.

Table 11. Simple correlations.

	Series in Levels		Series in Growth Rates		Series in Differences	
	1987-2007	1996-2007	1987-2007	1996-2007	1987-2007	1996-2007
Mex Division						
Total	0.93	0.87	0.30	0.50	0.76	0.82
1	0.94	0.89	0.15	0.23	0.52	0.57
2	0.57	-0.19	0.24	0.44	0.52	0.56
3	0.18	-0.03	0.32	0.49	0.23	0.19
4	0.80	0.59	0.22	0.47	0.40	0.27
5	0.92	0.79	0.31	0.44	0.64	0.67
6	0.92	0.92	0.15	0.31	0.67	0.63
7	0.94	0.83	0.35	0.40	0.50	0.47
8	0.91	0.79	0.20	0.43	0.61	0.60

I.3.1 Empirical Exercise

To formally estimate the statistical association between the series, we perform cointegration and common cycle tests and present the results in Tables 12 and 13 respectively.[11] We find no evidence of cointegration for the sample 1987-2007, with the exception of division 1, for which we obtained a significant and positive long-run elasticity of 0.61. For the post-NAFTA sample, however, we identify the existence of common trends for all cases, excluding division 6. The elasticities are positive and significant, which is in line with what we may have expected.

As for the common cycle results, we find that the series for total manufacturing does not share common movements with US imports in the short-run. Notice, nonetheless, that the estimated coefficient is statistically significant and positive. Hence, we may say that there exist a meaningful association between manufacturing production in Mexico and the US, they do not, however, share a common cycle. Indeed, only two of the divisions appear to share cycles, division 2 and division 7, though the statistics are significant only at the 99%. The case of the latter is particularly interesting, since it represents one

[11] Unit root tests on US import suggested that the series is integrated of order 1. We do not report the results for brevity.

of the major contributors to total manufacturing production. Given this fact, we could concede that the signing of NAFTA produced a closer association of cyclical activity, for at least some of the manufacturing sectors, across Mexico and the US. On the other hand, we should stress the finding of no evidence of synchronization for the industry as a whole. Hence, we maintain our contention that synchronization of the business cycles between the two countries is not likely to have been the result of synchronization of the manufacturing industry.

Table 12. Cointegration tests.

	Sample 1987-2007		Sample 1996-2007	
Mexican Series	Cointegration	Cointegrating Vector	Cointegration	Cointegrating Vector
Total	No		Yes	1, -0.29 (0.07)
Division 1	Yes	1, -0.61 (0.04)	Yes	1, -0.54 (0.04)
Division 2	No		Yes	1, -0.87 (0.03)
Division 4	No		Yes	1, -0.21 (0.07)
Division 5	No		Yes	1, -0.26 (0.03)
Division 6	No		No	
Division 7	No		Yes	1, -0.36 (0.05)
Division 8	No		Yes	1, -0.31 (0.15)

Standard error in parenthesis

Table 13. Common cycles tests 1996-2007.

Mexican Series	Common Cycle	Cofeature Vector
Total	No	1, -1.05 (0.10)
Division 1	No	1, -0.87 (0.11)
Division 2	Yes	1, -0.76 (0.16)
Division 4	No	1, -0.03 (0.14)
Division 5	No	1, -0.56 (0.11)
Division 6	No	1, -0.82 (0.12)
Division 7	Yes	1, -1.11 (0.18)
Division 8	No	1, -0.46 (0.08)

Standard error in parenthesis

Section II. Service sector GDP and aggregate consumption

II.1 The Argument

Here we suggest two possible channels whereby the economic dynamics of Mexico and the US became homogeneous. First, we argue that the transformation of Mexico into a service oriented economy, initiated in the late 1980's, contributed to produce similar economic fluctuations to those observed in the US. That is, as Mexico made the transition from a manufacturing oriented into a more service oriented economy, the dynamics of aggregate output tended to become more closely associated. This transition is illustrated in Graph 3, which shows the contribution of the service sector GDP to the aggregate. The scale was normalized. The data were obtained from Banco de Mexico

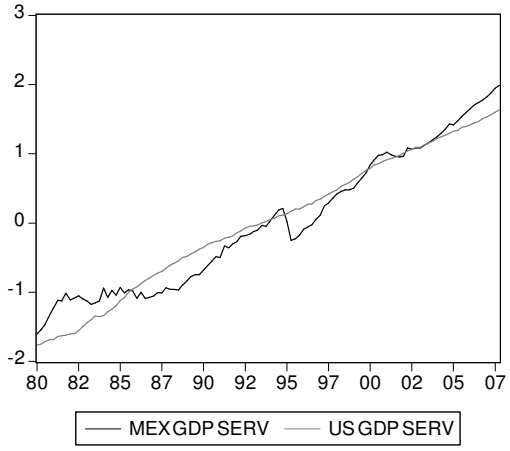
and it covers the period 1980-2007. It is worth noticing how the contribution of this sector increased significantly after the 1994-1995 peso crisis. That is, not only did trade increased after the signing of the trade agreement, but the productive orientation of the Mexican economy also changed. Once we recognize this fact, it can be reasonably argued that the similarities between the economic cycles of Mexico and the US may very well be the consequence of the transition of Mexico into a service oriented economy. This argument could be at least as suggestive as the argument that claims that the strengthening of the production-side links between the manufacturing industries in the two countries was the cause of economic synchronization.

Graph 3
Contribution to the Service Sector to Total GDP in Mexico

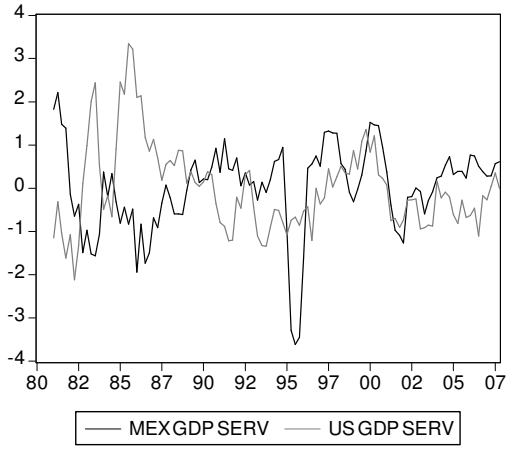
As a preliminary examination of this possibility, we illustrate the Mexican and US service GDP series in levels, growth rates and first differences in Graphs 4, 5, and 6 respectively. From the first graph it is evident that the variables follow a similar trend, though in the last few years they appear to have somewhat distinct trajectories. As for the growth rates and quarterly changes, in both cases we appreciate comparable fluctuations; especially since 1995. In the case the growth rates, the similarities are clear

for the economic slow-downs of the early 1980's, 1994-1995 and 2001. In fact, the only period in which the series appear not to follow the same pattern is in the early 1990's: while the US experienced a recession, Mexico's GDP grew at sustained rates. These dynamics hold for the series in first differences, which is a characteristic not found when analyzing the series for the manufacturing industry.

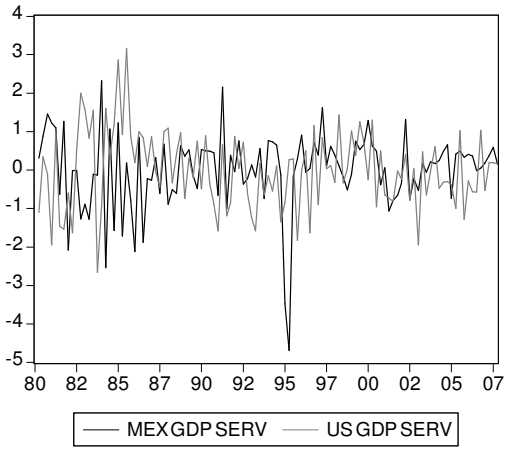
Graph 4
Service Sector GDP in Levels



Graph 5
Service Sector GDP in Growth Rates



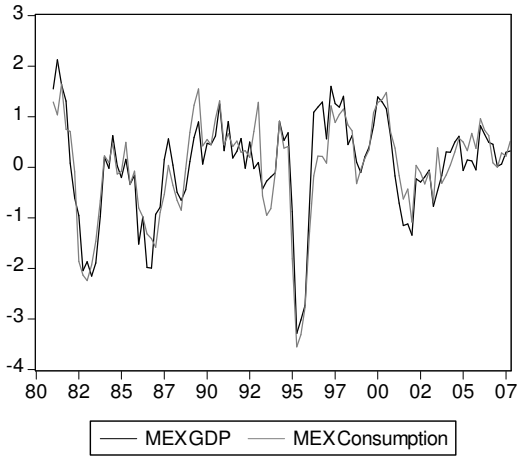
Graph 6
Service Sector GDP in First Differences



The second possibility we offer is related to the behavior of aggregate consumption in both countries, especially since 1988. As it is amply known, on that year Mexico began a profound transformation of its economy: market openness, privatization and liberalization officially initiated. One of the most significant changes during this episode occurred in the credit market; from 1988 to 1994 credit to the private sector grew at dramatic rates, not surprisingly consumption reported growth rates that were above those observed for GDP.[12] Graph 7 shows this evidence. Consumption data were obtained from Banco de Mexico and cover the sample period 1980-2007. Clearly, after the liberalization of the financial sector, and until just prior to the 1994 economic crisis, consumption grew faster than GDP, notice that before 1988 this was not the case. From 1994 to about 2000 consumption and GDP evolved at reasonable rates. After the 2001 economic slow-down, sustained growth returned and continued until the end of 2007.

[12] For a detailed analysis of the credit market and consumption in Mexico see Castillo (2003).

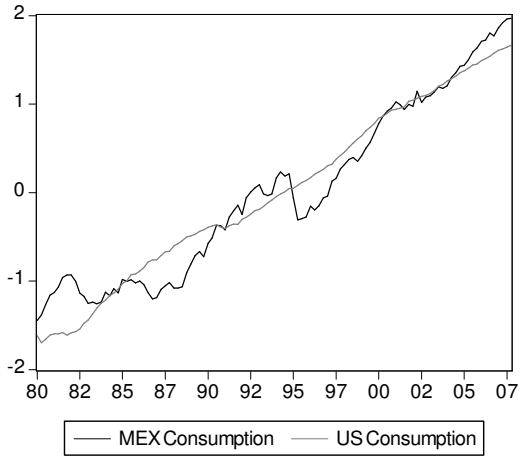
Graph 7
GDP and Consumption in Mexico: Growth Rates



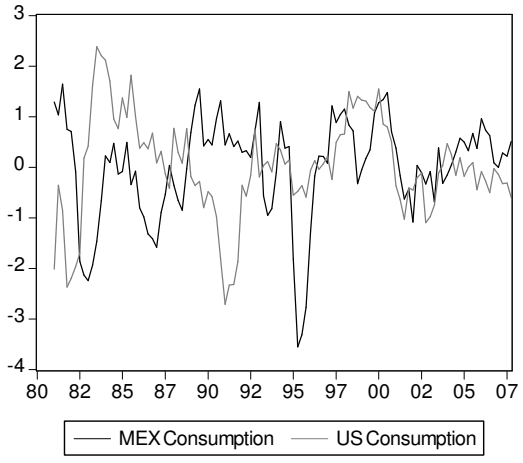
Just as we did in the case of the service sector GDP, here we present the levels, growth rates and first differences of consumption in Mexico and in the US. The series are illustrated in Graphs 8, 9, and 10 respectively. We observe a more or less similar trend between the series from about 1993 to 2004. For the more recent years, the Mexican series appears to have a steeper slope than the US series. This is reflected in the growth rates. Notice that from 2004 to 2007 the series follow opposite directions. This observation is consistent with the comments we made at the beginning of the document, when we indicated that the recent contrasting performances of the GDPs may be due to different consumption patters. It is worth mentioning that the growth rates exhibit similar dynamics for most of the rest of the sample, with the exception of the early 1990's. Interestingly, for the first differences it is difficult to identify an episode when the series do not behave in a similar fashion; perhaps only evident in 1991. In general, throughout the sample the ups and downs of consumption in Mexico follow the ups and downs of its US counterpart. As such, the graphical evidence provides some hope to

establish the existence of common cycles between consumption in Mexico and in the US.

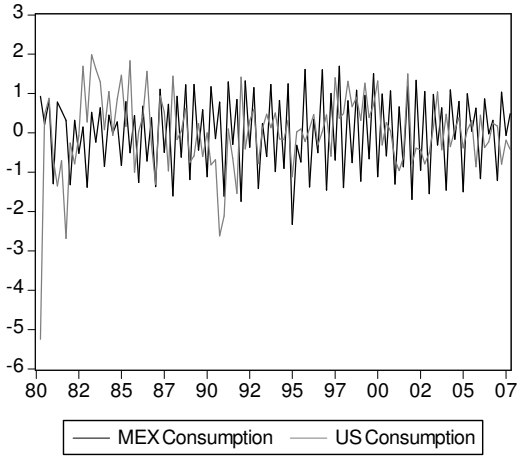
Graph 8
Consumption in Levels



Graph 9
Consumption in Growth Rates



Graph 10
Consumption in First Differences



II.2 Econometric Exercise

To formally investigate the association between production in the service sectors of Mexico and the US, and between aggregate consumption in both countries, we conduct cointegration and common cycle tests. As previously mentioned, we consider the gross domestic product from the service sector as reported by Banco de Mexico and the Bureau of Economic Analysis for the US. The data for aggregate private consumption comes from the same sources. In both cases the entire sample is from the first quarter of 1980 to the last quarter of 2007, though we also conduct tests for a shorter sample, 1996-2007. The series are in constant terms and were adjusted to account for seasonality.[13] The results are presented in Table 14.[14]

[13] We were unable to obtain sets of non-seasonally adjusted series for both, Mexico and the US. Nonetheless, our results appear to be robust to the use of seasonally adjusted series. See Herrera (2005) for the argument.

[14] Unit root tests results indicate that all the series considered in this section are I(1). Results are not shown for brevity.

We find cointegration for all cases. Long run elasticities for the 1996-2007 sample period are greater than for the entire period. It is worth mentioning that for consumption, the increase in the elasticity is substantial, from 0.92 to 1.53. In all cases the qualitative association is positive and the coefficients are statistically significant at conventional levels.

As for the common cycle tests, the results suggest the existence of common cycles for both candidates. In the case of the service GDP, we identify a significant and positive relationship for the two samples. The magnitude of the coefficient is greater for the post-NAFTA period, suggesting a short-run elasticity of the Mexican series with respect to the US series of 0.82. For consumption we find that the two series share a common cycle only for the more recent sample period. Our assessment is that the failure to identify a common cycle for the entire sample is possibly due to the distinct patters of behavior in the early 1990's, as shown in the graphical evidence. Although there appears to be a strong and positive relationship in other periods, the influence of said episode may be sufficient to reject the hypothesis of the existence of a common cycle. On the other hand, while consumption patterns are not similar in recent times, common movements in the 1996-2004 period are evidently strong enough to produce a common cycle between the series. It would be interesting to perform the test in the future to evaluate whether the 2007 credit crisis in the US led to the disruption of the common cycle currently present.

Overall, the econometric results confirming the existence of common cycles in the service sector GDPs and consumption, serve as the basis for arguing that the behavior of these two variables could very well be the source of economic synchronization in

Mexico and the US. Evidently, what we present here is only an introduction to a topic that certainly requires a more in-depth analysis. We will surely pursue this line of reasoning in future research.

Table 14. Cointegration and common cycles tests.

Cointegration Tests				
Mexican Series	US Series	Sample	Cointegration	Cointegrating Vector
GDP Services	GDP Services	1980-2007	Yes	1, -1.23 (0.05)
GDP Services	GDP Services	1996-2007	Yes	1, -1.34 (0.03)
Consumption	Consumption	1980-2007	Yes	1, -0.92 (0.03)
Consumption	Consumption	1996-2007	Yes	1, -1.53 (0.03)
Common Cycle Tests				
Mexican Series	US Series	Sample	Common Cycle	Cofeature Vector
GDP Services	GDP Services	1980-2007	Yes	1, -0.71 (0.13)
GDP Services	GDP Services	1996-2007	Yes	1, -0.82 (0.10)
Consumption	Consumption	1980-2007	No	1, -0.03 (0.07)
Consumption	Consumption	1996-2007	Yes	1, -0.15 (0.09)

Standard error in parenthesis

Section III. Conclusion

Business cycles synchronization between Mexico and the US has become accepted as a fact in the profession. The factors that contributed to this phenomenon, however, remain to be determined. Various studies have centered their attention on the manufacturing sector, for obvious reasons. However, while said exercises have shown that correlation across manufacturing productions increased since the signing of NAFTA, or that the

series are cointegrated, they do not identify whether manufacturing outputs in both countries share a common cycle. That is, it is not clear that synchronization of economic activity in the manufacturing industry led to the synchronization of the business cycles. Indeed, in this document we provide evidence that, while manufacturing productions share common trends, and in most cases statistically significant short-run associations, they do not exhibit a common cycle. Hence, it renders the claim that synchronization of economic activity in this sector prompted the synchronization of the business cycles unfounded. We then propose two possibilities for explaining business cycle synchronization: GDP of the service sector and aggregate consumption. Our results show some promising venues for further research. That is, we find that both candidates share common trends and common cycles, though in the case of consumption the latter is found only for the post-NAFTA period. Nonetheless, our results should provide the basis for conducting more rigorous and detailed exercises considering the two possibilities we proposed in this document.

References

Beveridge, S. and C. Nelson. 1981. A New Approach to Decomposition of Economic Time Series into Permanent and Transitory Components with Particular Attention to the Measurement of the Business Cycle. *Journal of Monetary Economics*, 7: 151-174.

Castillo, R. 2003. Restricciones de Liquidez, el Canal de Crédito, y el Consumo en México. *Economía Mexicana Nueva Epoca*, 12: 65-101.

Castillo, R., and R. Ramirez. 2008. Economic Integration in North America. Forthcoming, *Applied Econometrics and International Development*.

Chiquiar, D. and M. Ramos-Francia. 2005. Trade and Business-Cycle Synchronization: evidence from Mexican and U.S. Manufacturing Industries. *North American Journal of Economics and Finance*, 16:187-216.

Cubadda, G. 1999. Common Cycles in Seasonal Non-stationary Time Series. *Journal of Applied Econometrics*, 14: 273-291.

Cuevas, A., M. Messmacher, and A. Werner. 2003. Sincronización Macroeconómica entre México y sus Socios Comerciales del TLCAN. Working Paper 2003-1 Banco de México.

Fernandez, V. and A. Kutan. 2005. Do Regional Integration Agreements Increase Business Cycle Convergence? Evidence from APEC and NAFTA. Working Paper 765, William Davidson Institute.

Fragoso, E., J. Herrera, and R. Castillo. 2008. La Sincronización de los Ciclos Económicos de México y Estados Unidos. *Economía Mexicana, Nueva Epoca*, 17: 5-47.

Hecq, A. 1998. Does Seasonal Adjustment Induce Common Cycles. *Economics Letters*, 59: 289-297.

Herrera, J. 2004. Business Cycles in Mexico and the United States: do They Share Common Movements? *Journal of Applied Economics*, 7: 303-323.

Imbs, J. 2003. Trade, Finance, Specialization and Synchronization. CEPR Discussion Paper No. 3779.

Johansen, S. 1991. Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica* 59: 1551-1580.

Kose, A. and C. Roberto. 2004. Economic Integration, Business Cycle, and Productivity in North America. International Monetary Fund Working Paper 04/138.

Mejia-Reyes P., E. Gutiérrez, and C. Farias. 2006. La Sincronización de los Ciclos Económicos de México y Estados Unidos. *Investigación Económica*, 65: 15-46.

Rosmy, L. and D. Simons. 2007. Is there a North American Business Cycle? An Analysis of the Period 1963-2002. *Applied Econometrics and International Development*, 7: 109-120.

Stock, J. and M. Watson. 1988. Testing for Common Trends. *Journal of the American Statistical Association*, 83: 1097-1107.

Torres, A. and O. Vela. 2003. Trade Integration and Synchronization between Business Cycles of Mexico and the United States. *North American Journal of Economics and Finance*, 14: 319-342.

Vahid, F. and R. Engle. 1993. Common Trends and Common Cycles. *Journal of Applied Econometrics*, 8: 341-360.

Appendix

Data Construction

US: we considered industrial production indexes according to the North American Industry Classification System (NAICS). In the case of divisions 1, 3, 6, and 7 we did not modify the series since their descriptions match those for the Mexican divisions. For divisions 2, 4, 5 and 8 we weighted the indexes by the contribution of each division to total manufacturing. The weights were obtained from the Bureau of Economics Analysis. For example, for division 2 (textiles, apparel and leather products) we proceeded as follows:

Total Weight= Percentage of textiles and related products + Percentage of apparel and leather products

Weight1 (for textiles and related products index) = Percentage/total weight

Weight2 (for apparel and leather products index) = Percentage/total weight

Division 2 series = (textiles and related products index)* Weight1 + (apparel and leather products index)*Weight2

The description for the matched series is as follows:

Mexican Divisions		US Divisions	
Division I	Food products, beverages and tobacco	NAICS 311, 312	Food, beverage, and tobacco
Division II	Textiles , apparel and leather industry	NAICS 313	Textiles and products
		NAICS 314	Apparel and leather goods
Division III	Wood and wooden products industry	NAICS 321	Wood
Division IV	Paper, paper products, printing and editorials	NAICS 322	Paper
		NAICS 323	Printing and related support activities
Division V	Chemical substances, products derived from petroleum rubber and plastic products	NAICS 324	Petroleum and coal products
		NAICS 325	Chemical
		NAICS 326	Plastics and rubber products
Division VI	Nonmetallic mineral products, except those derived from petroleum and coal	NAICS 327	Nonmetallic mineral products
Division VII	Primary metal industries	NAICS 331	Primary metal
Division VIII	Metallic products, machinery and equipment	NAICS 332	Fabricated metal product
		NAICS 333	Machinery
		NAICS 334	Computer and electronic product
		NAICS 335	Electrical equipment, appliance and component
		NAICS 336	Transportation equipment
		NAICS 337	Furniture and related product

Cointegration and Common Cycle Results

Corresponds to Table 8: Cointegration Tests

Sample 1980-2007					
System	Hypothesis on *r*	p Value	System	Hypothesis on *r*	p Value
Total - Total	0	0.03	Total - IP	0	0.05
	1	0.84		1	0.86
Div. 1 - Div. 1	0	0.00	Div. 1 - IP	0	0.05
	1	0.94		1	0.85
Div. 2 - Div. 2	0	0.00	Div. 2 - IP	0	0.01
	1	0.89		1	0.92
Div. 4 - Div. 4	0	0.01	Div. 4 - IP	0	0.00
	1	0.40		1	0.89
Div. 5 - Div. 5	0	0.00	Div. 5 - IP	0	0.00
	1	0.75		1	0.92
Div. 6 - Div. 6	0	0.05	Div. 6 - IP	0	0.05
	1	0.62		1	0.95
Div. 7 - Div. 7	0	0.01	Div. 7 - IP	0	0.05
	1	0.65		1	0.97
Div. 8 - Div. 8	0	0.05	Div. 8 - IP	0	0.05
	1	0.32		1	0.68

Corresponds to Table 9: Common Cycle Tests

Sample 1980-2007					
System	Hypothesis on *s*	p Value	System	Hypothesis on *s*	p Value
Total - Total	> 0	0.00	Total - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 1 - Div. 1	> 0	0.00	Div. 1 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 2 - Div. 2	> 0	0.00	Div. 2 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 4 - Div. 4	> 0	0.00	Div. 4 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 5 - Div. 5	> 0	0.75	Div. 5 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 6 - Div. 6	> 0	0.00	Div. 6 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 7 - Div. 7	> 0	0.00	Div. 7 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 8 - Div. 8	> 0	0.00	Div. 8 - IP	> 0	0.00
	> 1	0.00		> 1	0.00

Corresponds to Table 10: Common Cycle Tests

Sample 1996-2007					
System	Hypothesis on *s*	p Value	System	Hypothesis on *s*	p Value
Total - Total	> 0	0.00	Total - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 1 - Div. 1	> 0	0.00	Div. 1 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 2 - Div. 2	> 0	0.00	Div. 2 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 4 - Div. 4	> 0	0.00	Div. 4 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 5 - Div. 5	> 0	0.26	Div. 5 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 6 - Div. 6	> 0	0.00	Div. 6 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 7 - Div. 7	> 0	0.00	Div. 7 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 8 - Div. 8	> 0	0.00	Div. 8 - IP	> 0	0.00
	> 1	0.00		> 1	0.00

Corresponds to Table 12: Cointegration Tests

Sample 1987-2007			Sample 1996-2007		
System	Hypothesis on *r*	p Value	System	Hypothesis on *r*	p Value
Total - Imports	0	0.62	Total - Imports	0	0.04
	1	0.92		1	0.94
Div. 1 - Imports	0	0.01	Div. 1 - Imports	0	0.01
	1	0.91		1	0.39
Div. 2 - Imports	0	0.20	Div. 2 - Imports	0	0.05
	1	0.32		1	0.90
Div. 4 - Imports	0	0.09	Div. 4 - Imports	0	0.04
	1	0.85		1	0.81
Div. 5 - Imports	0	0.17	Div. 5 - Imports	0	0.00
	1	0.95		1	0.66
Div. 6 - Imports	0	0.36	Div. 6 - Imports	0	0.07
	1	0.83		1	0.41
Div. 7 - Imports	0	0.31	Div. 7 - Imports	0	0.01
	1	0.73		1	0.31
Div. 8 - Imports	0	0.66	Div. 8 - Imports	0	0.05
	1	0.69		1	0.64

Corresponds to Table 13: Common Cycle Tests

System	Hypothesis on *s*	p Value
Total - Imports	> 0	0.00
	> 1	0.00
Div. 1 - Imports	> 0	0.00
	> 1	0.00
Div. 2 - Imports	> 0	0.01
	> 1	0.00
Div. 4 - Imports	> 0	0.00
	> 1	0.00
Div. 5 - Imports	> 0	0.00
	> 1	0.00
Div. 6 - Imports	> 0	0.00
	> 1	0.00
Div. 7 - Imports	> 0	0.01
	> 1	0.00
Div. 8 - Imports	> 0	0.00
	> 1	0.00

Corresponds to Table 14: Cointegration Tests

Sample 1980-2007			Sample 1996-2007		
System	Hypothesis on *r*	p Value	System	Hypothesis on *r*	p Value
Services - Services	0	0.00	Services - Services	0	0.00
	1	0.11		1	0.11
Consumption - Consumption	0	0.00	Consumption - Consumption	0	0.00
	1	0.22		1	0.15

Corresponds to Table 14: Common Cycle Tests

Sample 1980-2007			Sample 1996-2007		
System	Hypothesis on *s*	p Value	System	Hypothesis on *s*	p Value
Services - Services	> 0	0.02	Services - Services	> 0	0.20
	> 1	0.00		> 1	0.00
Consumption - Consumption	> 0	0.00	Consumption - Consumption	> 0	0.16
	> 1	0.00		> 1	0.00